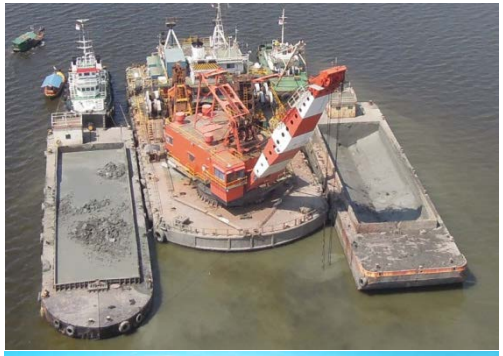
PERENCANAAN PEMECAH GELOMBANG (*BREAKWATER*) DAN PENGERUKAN (*DREDGING*) DI TERMINAL KHUSUS TPPI TUBAN, JAWA TIMUR

OLEH:
FAHMI NURULIL AMRI YUNUS
3112 100 150

DOSEN PEMBIMBING:
IR. DYAH IRIANI WIDYASTUTI, M.SC
CAHYA BUANA, ST., MT.



PENDAHULUAN

LATAR BELAKANG

- Meningkatnya konsumsi minyak di Indonesia
- Dibangun Jetty Baru di TPPI Tuban Bagian Utara
- Diperlukan Breakwater dan Pengerukan

LATAR BELAKANG

LOKASI

Letak geografis dari kota Tuban adalah 06° 45' 38.1" LS dan 111° 57’ 39.0" BT.

Rumusan Masalah

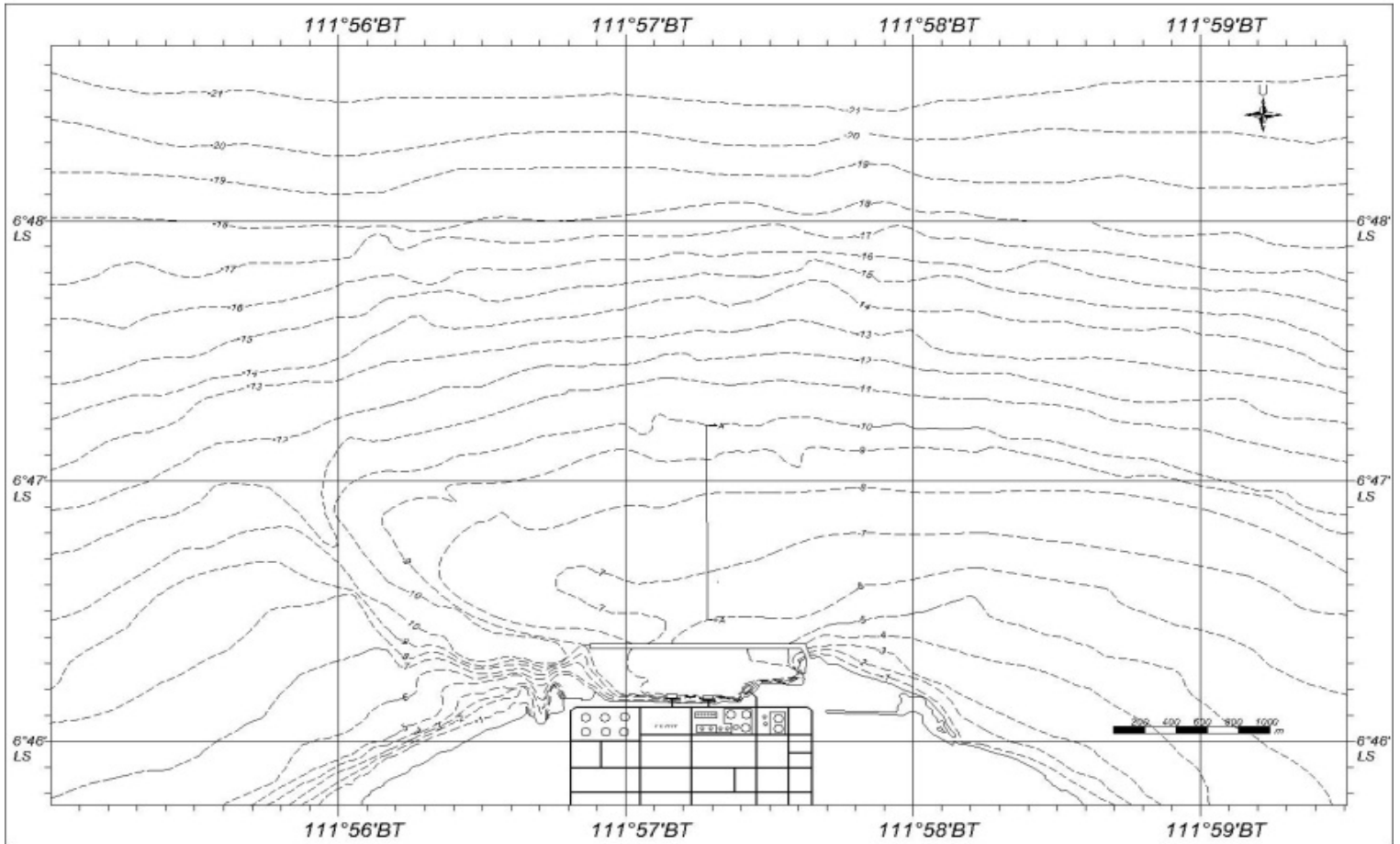
- Rumusan masalah dalam perencanaan breakwater ini adalah diperlukannya breakwater baru akibat adanya pengembangan pelabuhan TPPI dibagian utara yang belum terlindung dari gelombang.

LINGKUP BAHASAN

- Pendahuluan
- Tinjauan Pustaka
- Pengumpulan dan Analisis Data
- Kriteria Desain
- Evaluasi Layout
- Perencanaan Struktur Breakwater
- Perencanaan Pengerukan
- Metode Pelaksanaan
- WBS dan RAB

Data Bathymetri

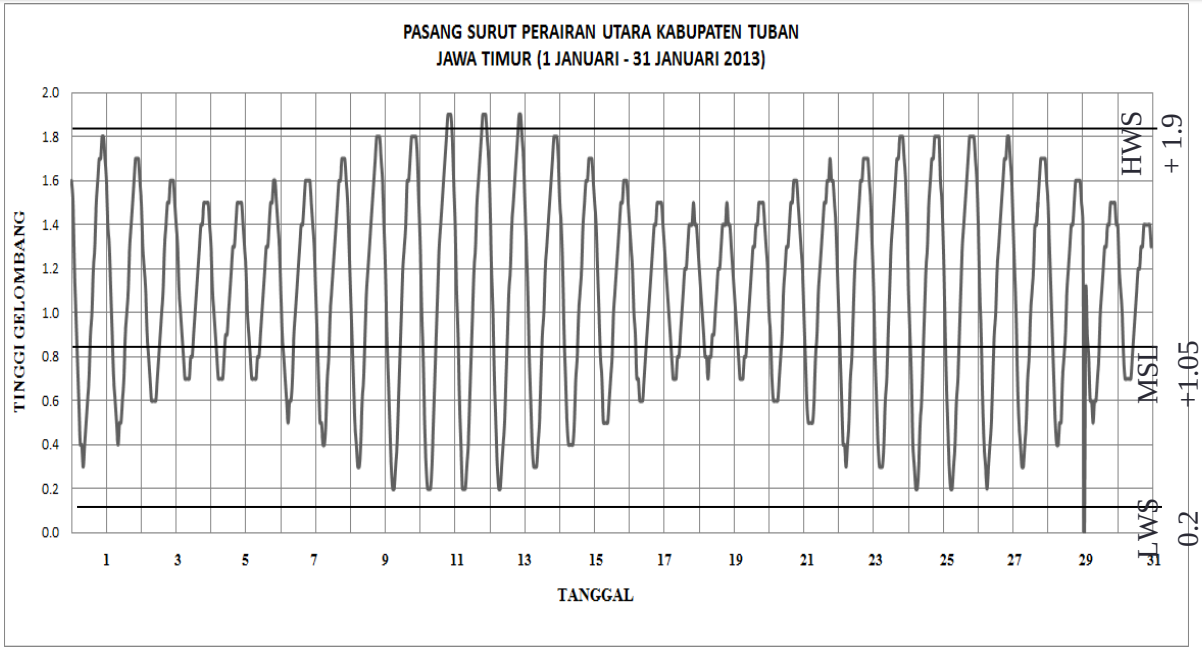
- Kedalaman di lokasi breakwater adalah -7 mLWS
- Kemiringan dasar laut cukup landai 1:300



Data Arus

- Data arus yang digunakan dalam tugas akhir kali ini adalah data yang di peroleh dari keterangan orang lapangan.
- Kecepatan arus yang terjadi cukup rendah sebesar 0.95 m/s.
- arus tidak mengganggu navigasi kapal karena kecepatannya masih di bawah kecepatan ijin 3 knot (1.5 m/s) dan tidak terjadi *cross current.*

Data Pasang Surut



Analisis Data pasang surut sebagai berikut:

- Pasang surut yang terjadi adalah *diurnal* (harian tunggal)
- Beda pasang surut 1.7 m diatas mLWS
- Elevasi HWS (High Water Spring) pada +1.7 mLWS
- Elevasi LWS (Low Water Spring) pada 0.00 mLWS
- Elevasi MSL (Mean Sea Level) pada +1.05 mLWS

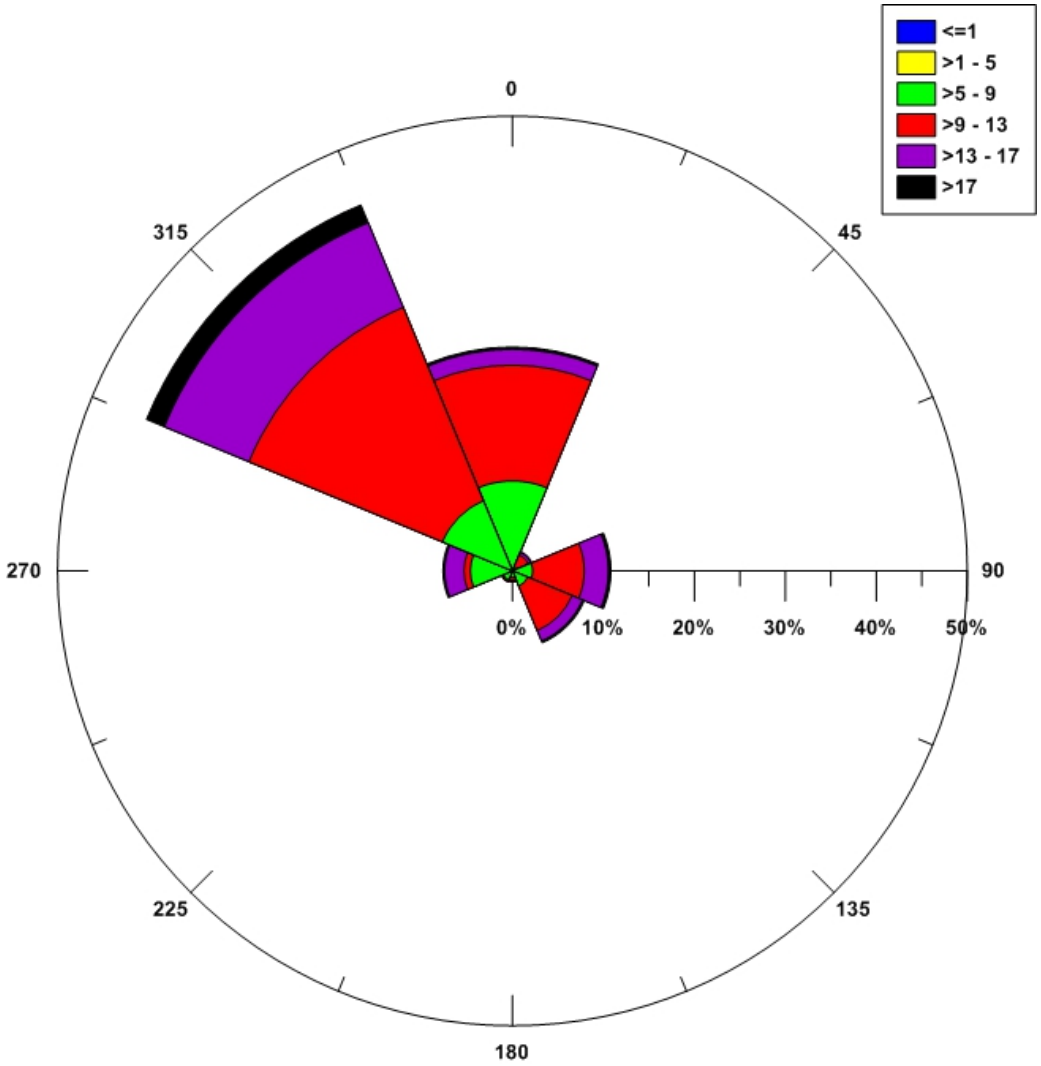
DATA ANGIN

- Data angin didapatkan dari *National Oceanic and Atmocpheric Administration (NOAA) di Stasiun Ahmad Yani, Semarang*

Banyaknya Angin yang Terjadi								
KECEPATAN (knot)	ARAH ANGIN							
	utara	timur laut	timur	tenggara	selatan	barat daya	barat	barat laut
1≤	4							
1-5	4	1	4	5	3	1	2	4
5-9	355	18	75	64	24	38	167	300
9-13	455	49	204	188	11	7	23	833
13-17	67	13	95	44	4	1	78	366
≥17	17	3	17	11	3	1	8	85
Jumlah	898	84	395	312	45	48	278	1588
Total	3652							

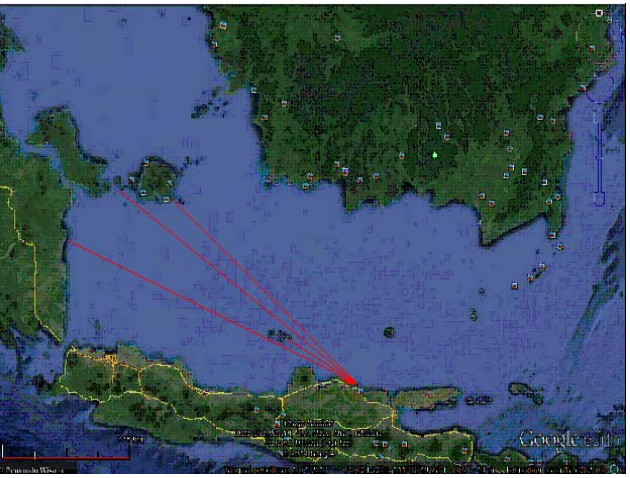
Persentase Kejadian Angin dalam %									
Kecepatan	Arah Angin								Jumlah
	utara	timur laut	timur	tenggara	selatan	barat daya	barat	barat laut	
1≤	0.11								0.11
1-5	0.11	0.03	0.11	0.14	0.08	0.03	0.05	0.11	0.66
5-9	9.72	0.49	2.05	1.75	0.66	1.04	4.57	8.21	28.50
9-13	12.46	1.34	5.59	5.15	0.30	0.19	0.63	22.81	48.47
13-17	1.83	0.36	2.60	1.20	0.11	0.03	2.14	10.02	18.29
≥17	0.47	0.08	0.47	0.30	0.08	0.03	0.22	2.33	3.97
Jumlah	24.59	2.30	10.82	8.54	1.23	1.31	7.61	43.48	100.00

Windrose

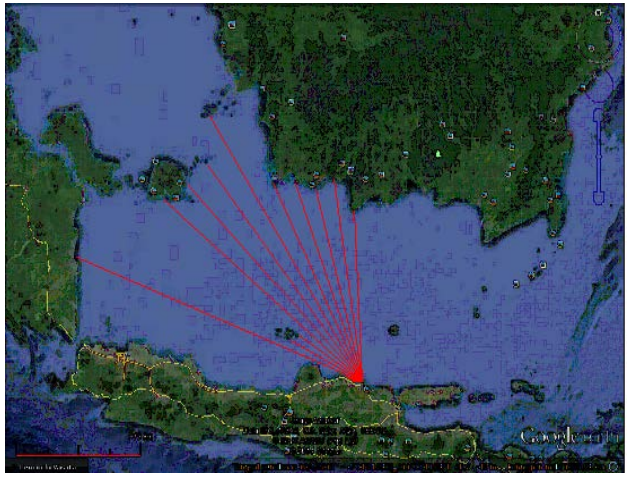


PERAMALAN GELOMBANG

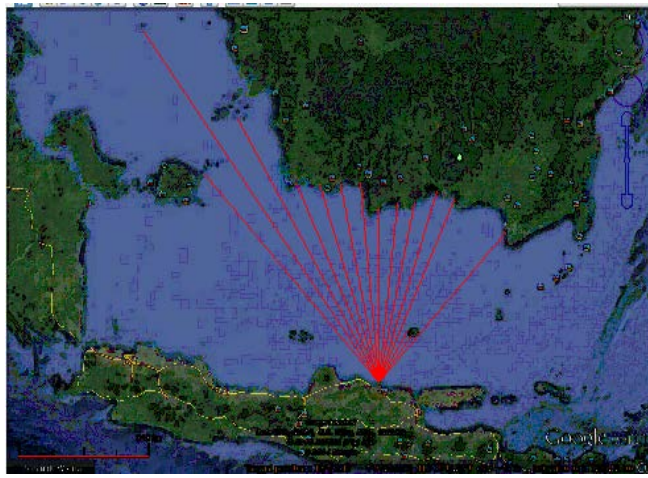
Fetch



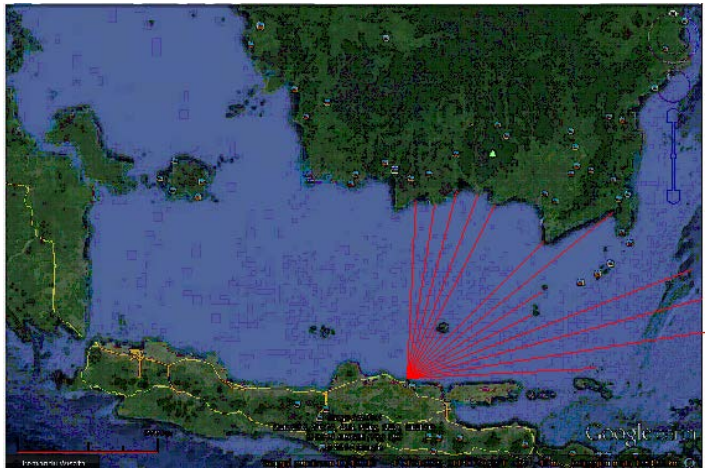
Barat



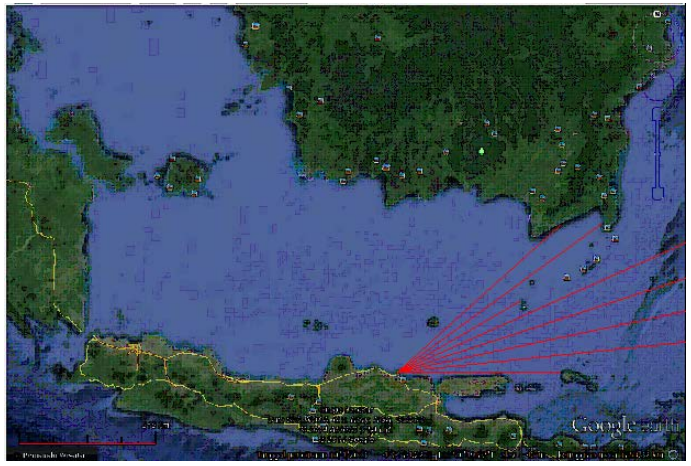
Barat Laut



Utara



Timur Laut



Timur

Fetch Efektif

α	Cos α	Xi					Xi.Cos α				
		B	BL	U	TL	T	B	BL	U	TL	T
42	0.743	500.000	386.53	463.43	427.22	0	371.5724	287.25	344.40	317.49	0.00
36	0.809	500.000	465.44	129.05	500	0	404.5085	376.55	104.40	404.51	0.00
30	0.866	198.550	452.41	132.07	500	0	171.9493	391.80	114.38	433.01	0.00
24	0.914	500.000	478.5	456.71	500	0	456.7727	437.13	417.23	456.77	0.00
18	0.951	43.570	500	460.05	319.36	0	41.43753	475.53	437.53	303.73	0.00
12	0.978	35.710	500	422.45	368.4	0	34.92965	489.07	413.22	360.35	0.00
6	0.995	27.560	500	411.88	500	0	27.40902	497.26	409.62	497.26	0.00
0	1.000	25.000	500	398.51	442.41	500	25	500.00	398.51	442.41	500.00
6	0.995	0.000	500	458.9	133.37	500	0	497.26	456.39	132.64	497.26
12	0.978	0.000	192.72	465.85	128.28	500	0	188.51	455.67	125.48	489.07
18	0.951	0.000	205.67	476.05	446.31	500	0	195.60	452.75	424.47	475.53
24	0.914	0.000	500	495.8	449.4	500	0	456.77	452.94	410.55	456.77
30	0.866	0.000	44.2	500	442.75	329.02	0	38.28	433.01	383.43	284.94
36	0.809	0.000	31.51	500	403.28	500	0	25.49	404.51	326.26	404.51
42	0.743	0.000	24.7	500	410.84	500	0	18.36	371.57	305.31	371.57
Total	13.511						1533.58	4874.86	5666.12	5323.67	3479.66
Fetch Efektif (Km)							113.5067	360.8091	419.3736	394.027	257.544

Fetch efektif B = 113,5 km
Fetch efektif BL = 360,8 km
Fetch efektif U = 419,4 km
Fetch efektif TL = 394,0 km
Fetch efektif T = 257,5 km

Tinggi dan Periode Gelombang

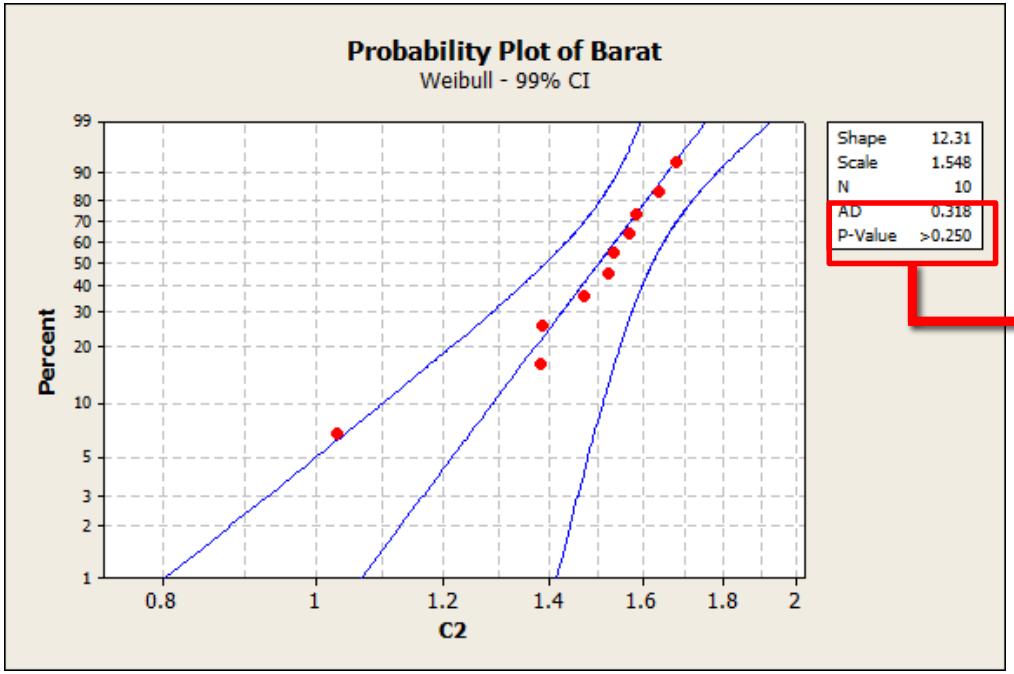
Tahun	Bulan	Kec. Mac		Arah		t	H_{mo}	T_m
		(knot)	(m/s)	(˚)	Mata Angin	(jam)	(m)	(s)
2006	Jan	21.0	10.5	330	barat laut	17.57	5.25	11.44
2007	Jul	58.0	29.0	330	barat laut	13.11	12.62	15.33
2008	Apr	40.0	20.0	110	timur	11.91	7.25	12.04
2009	Feb	48.1	24.0	20	utara	15.66	10.80	14.92
2010	Jul	52.9	26.5	110	timur	10.87	9.53	13.19
2011	Jan	22.0	11.0	320	barat laut	17.24	5.55	11.66
2012	Sep	37.9	19.0	100	timur	12.17	6.79	11.78
2013	Jan	36.0	18.0	360	utara	16.84	8.68	13.87
2014	Jun	24.1	12.1	100	barat daya	17.25	5.55	11.65
2015	Mei	38.1	19.1	70	timur	13.76	4.70	10.43

Waktu		Angin Sedang (11-16 knot)	Angin Kuat (17-27 knot)
Musim Barat	Durasi Angin Maksimum	7 jam	6 jam
	Durasi Angin Minimum	5 jam	3 jam
Musim Peralihan	Durasi Angin Maksimum	7 jam	5 jam
	Durasi Angin Minimum	5 jam	2 jam
Musim Timur	Durasi Angin Maksimum	8 jam	4 jam
	Durasi Angin Minimum	6 jam	1 jam

Tinggi dan Periode Gelombang Koreksi

Tahun	Bulan	Kec. Max		Arah		t	H	T
		(Knot)	(m/s)	(˚)	Mata Angin	(hr)	(m)	(s)
2006	Jan	21	10.5	330	barat laut	3.5	1.57	5.11
2007	Jul	58.0	29.0	330	barat laut	3	4.56	7.59
2008	Apr	40.0	20.0	110	timur	3	2.58	6.04
2009	Feb	48.1	24.0	20	utara	3	3.42	6.76
2010	Jul	52.9	26.5	110	timur	3	3.96	7.18
2011	Jan	22.0	11.0	320	barat laut	3.5	1.68	5.25
2012	Sep	37.9	19.0	100	timur	3	2.37	5.85
2013	Jan	36.0	18.0	360	utara	3	2.38	5.85
2014	Des	24.1	12.1	100	timur	3	1.50	4.87
2015	Mei	38.1	19.1	70	timur	3	2.39	5.87

PENENTUAN DISTRIBUSI



P value = 0,25
= 25%
α = 1%

P value > α

Berdistribusi Weibull

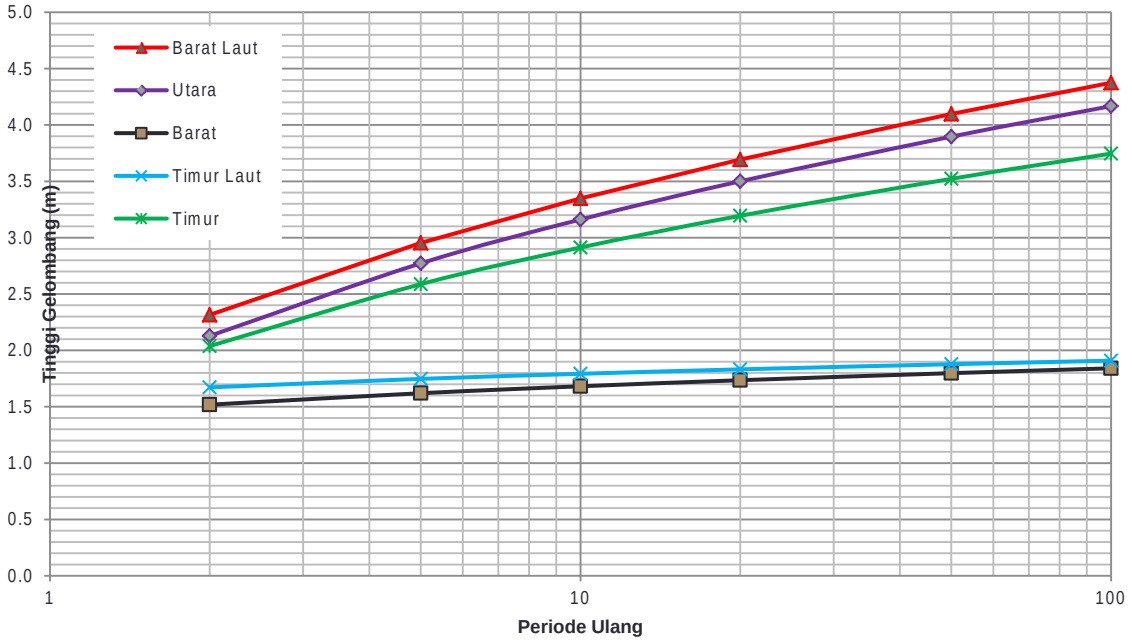
H_0 = Data berdistribusi weibull

H_1 = Data tidak berdistribusi weibull

Jika, P-value < α maka data dinyatakan tolak H_0

Tinggi Gelombang Periode Ulang

Periode Ulang	Tinggi Gelombang Periode Ulang (m)				
(Tahun)	Barat	Barat Laut	Utara	Timur Laut	Timur
2	1.518	2.315	2.128	1.672	2.038
5	1.620	2.954	2.772	1.747	2.588
10	1.682	3.348	3.161	1.792	2.913
20	1.735	3.693	3.500	1.832	3.194
50	1.798	4.098	3.896	1.877	3.522
100	1.841	4.375	4.167	1.909	3.746



Refraksi Gelombang Periode Ulang

utara

α_0	H	T	d	Kr = $(\cos\alpha_0/\cos\alpha)^{0.5}$	Ks	H = Kr*Ks*H	γ = H/d	Ket
15	3.90	9.99	10	0.989	0.984	3.79	0.38	Normal
15	3.90	9.99	9	0.988	0.998	3.84	0.43	Normal
15	3.90	9.99	8	0.988	1.019	3.92	0.49	Normal
15	3.90	9.99	7	0.987	1.042	4.01	0.57	Normal

timur

α_0	H	T	d	Kr = $(\cos\alpha_0/\cos\alpha)^{0.5}$	Ks	H = Kr*Ks*H	γ = H/d	Ket
85	3.52	9.50	10	0.333	0.969	1.14	0.11	Normal
85	3.52	9.50	9	0.305	0.984	1.06	0.12	Normal
85	3.52	9.50	8	0.324	1.001	1.14	0.14	Normal
85	3.52	9.50	7	0.320	1.023	1.15	0.16	Normal

timur laut

α_0	H_{S0}	T	d	Kr = $(\cos\alpha_0/\cos\alpha)^{0.5}$	Ks	H = Kr*Ks*H	γ = H/d	Ket
45	1.88	6.93	10	0.923	0.916	1.59	0.16	Normal
45	1.88	6.93	9	0.915	0.920	1.58	0.18	Normal
45	1.88	6.93	8	0.908	0.928	1.58	0.20	Normal
45	1.88	6.93	7	0.900	0.939	1.59	0.23	Normal

TINGGI GELOMBANG KEDALAMAN -7 m LWS

Arah	H (m)
Barat	0.588
Barat Laut	3.738
Utara	4.008
Timur Laut	1.587
Timur	1.154

Tinggi Gelombang Berdasarkan Windrose

BARAT DAN UTARA

Kec. Angin		R_T	R_L	U_W	U_A	t	H_{mo}	T_m
(Knot)	(m/s)					(jam)	(m)	(s)
1-5	1.75	1.1	1.9	3.66	3.50	7	0.36	3.27
5-9	3.75	1.1	1.6	6.60	7.23	7	0.90	4.70
9-13	5.75	1.1	1.5	9.49	11.30	7	1.57	5.87
13-17	7.75	1.1	1.3	11.08	13.68	5	1.55	5.46
≥17	12	1.1	1.05	13.86	18.01	3	1.49	4.85

Timur

Kec. Angin		R_T	R_L	U_W	U_A	t	H_{mo}	T_m
(Knot)	(m/s)					(jam)	(m)	(s)
1-5	1.75	1.1	1.9	3.66	3.50	8	0.40	3.49
5-9	3.75	1.1	1.6	6.60	7.23	8	0.99	5.02
9-13	5.75	1.1	1.5	9.49	11.30	8	1.73	6.28
13-17	7.75	1.1	1.3	11.08	13.68	6	1.78	5.98
≥17	12	1.1	1.05	13.86	18.01	3	1.49	4.85

Refraksi Berdasarkan Frekuensi Gelombang

UTARA

H	Dari LWS			
(m)	H-10	H-9	H-8	H-7
0.36	0.36	0.36	0.36	0.36
0.90	0.85	0.84		
1.57	1.44	1.43		
1.55	1.41	1.42		
1.49	1.40	1.39		

BARAT LAUT

H	Dari LWS			
(m)	H-10	H-9	H-8	H-7
0.36	0.36	0.36	0.36	0.35
0.90	0.83	0.82	0.80	0.79
			1.33	1.33
			1.33	1.32
			1.32	1.29

TIMUR

H	Dari LWS			
(m)	H-10	H-9	H-8	H-7
0.40	0.36	0.32	0.37	0.25
0.99	0.46	0.42	0.40	0.37
1.73	0.63	0.61	0.59	0.58
1.78	0.67	0.64	0.62	0.60
1.49	0.72	0.65	0.62	0.58

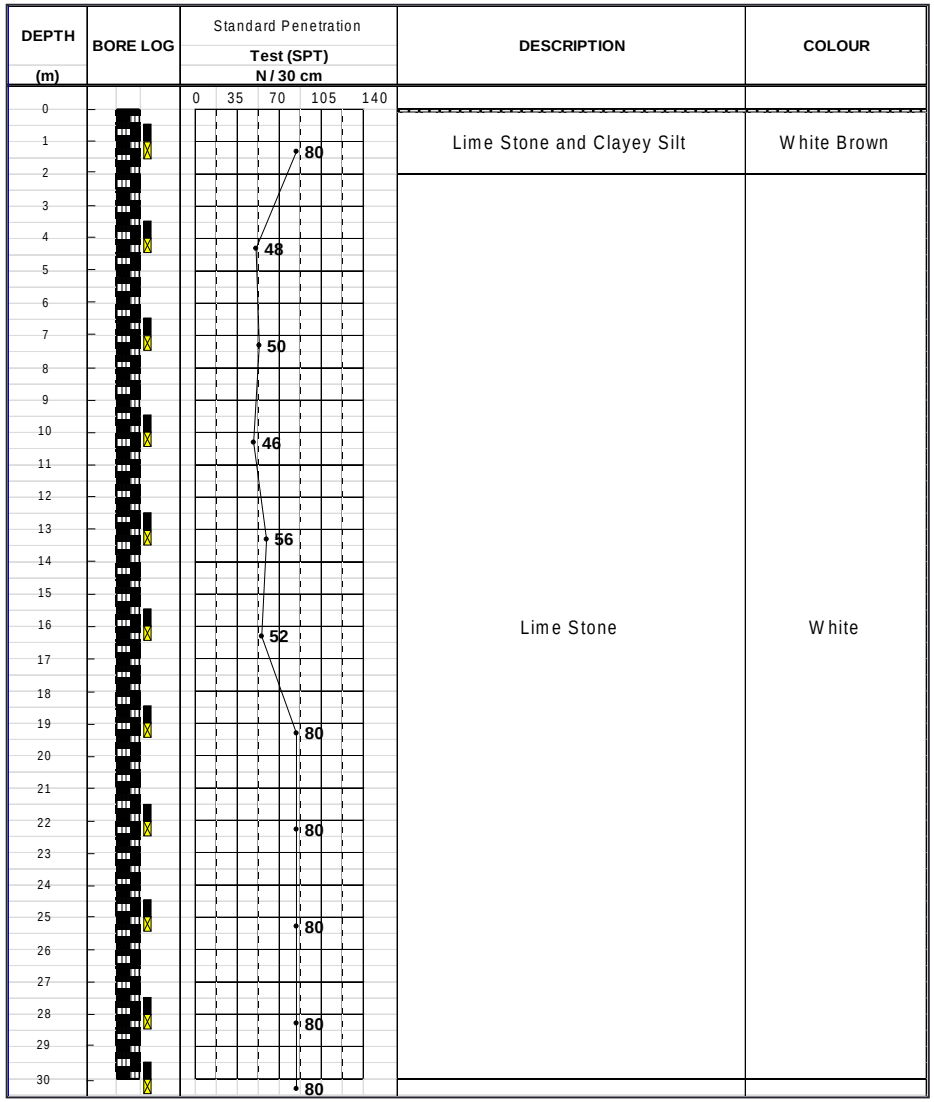
BARAT

H	Dari			
(m)	H-10	H-9		
0.36	0.36	0.31	0.29	0.26
0.90	0.45	0.42	0.39	0.36
1.57	0.60	0.58	0.55	0.54
1.55	0.63	0.64	0.58	0.55
1.49	0.72	0.67	0.62	0.58

BARAT DAYA

H			WS	
(m)			H-8	H-7
0.40	0.40	0.39	0.37	0.38
0.99	0.90	0.89	0.87	0.86
1.73	1.48	1.47	1.47	1.46
1.78	1.53	1.52	1.51	1.50
1.49	1.37	1.34	1.32	1.29

Data Tanah



		Cohesionless Soil / Sol Pulvérulent				
N	(blows)	0 - 3	4 - 10	11 - 30	31 - 50	> 50
γ	(KN/m³)	-	12 - 16	14 - 18	16 - 20	18 - 23
Ø	(°)	-	25 - 32	28 - 36	30 - 40	> 35
State		Very Loose	Loose	Medium	Dense	Very Dense
Dr	(%)	0 - 15	15 - 35	35 - 65	65 - 85	85 - 100
		Cohesive Soil / Sol Cohérent				
N	(blows)	< 4	4 - 6	6 - 15	16 - 25	> 25
γ	(KN/m³)	14 - 18	16 - 18	16 - 18	16 - 20	> 20
qu	(kPa)	< 25	20 - 50	30 - 60	40 - 200	> 100
Consistency		Very Soft	Soft	Medium	Stiff	Hard

Jenis Tanah = *Limestone*

γs = 2 t/m^3

ø = 36^o

Koefisien tekanan tanah aktif:

$$K_a = tan^2\left(45 - \frac{36}{2}\right) = 0.259$$

Koefisien tekanan tanah pasif:

$$K_p = tan^2\left(45 + \frac{36}{2}\right) = 3.851$$

KRITERIA DESAIN

Material

- **Mutu Beton**

σ'_{bk} = 30 Mpa

= 300 kg/cm^2

Modulus Elastisitas berdasarkan PBI 1971

Eb = $6400\sqrt{300}$ kgf.cm^{-2} = 1.108×10^5 kgf.cm^{-2}

- **Mutu Baja Tulangan**

Modulus elastisitas (Ea) : 2.1×10^5 kgf.cm^{-2}

Tegangan leleh karakteristik 3200 kg/cm^2

σ_a = 1280 kgf.cm^{-2}

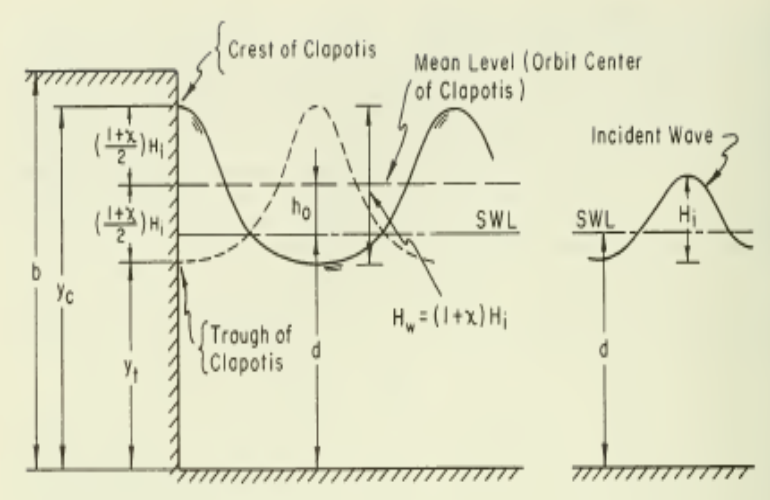
σ'_{au} = 2780 kgf.cm^{-2}

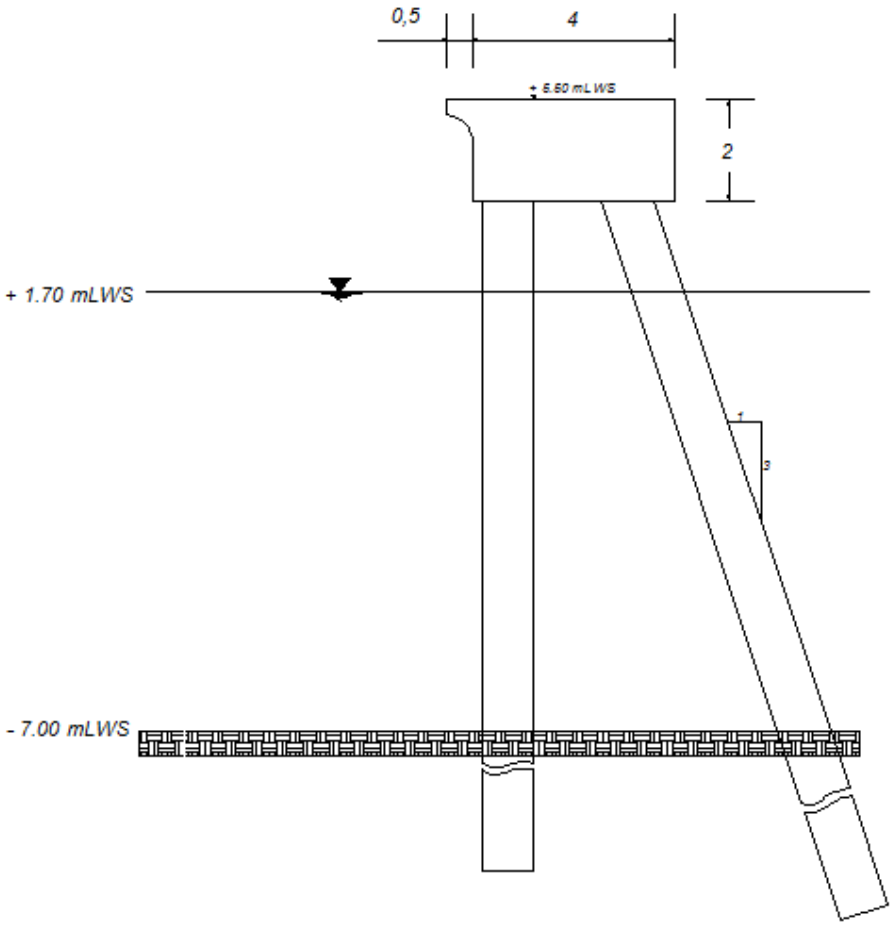
Kriteria Kapal

Spesifikasi Kapal LPG 15000 DWT:

- DWT (Dead Weight Tonage) = 15000 ton
- Dispalcement Tonage = 20000 ton
- LoA (Panjang kapal) = 146.7 m
- Lpp (Panjang Perpendicular) = 135.5 m
- Lebar kapal (B) = 24 m
- Draft kapal (D) = 9.56 m

Tinggi Struktur





Data perencanaan:

d = -7.00 mLWS

h_o = 1.70 m

H_i = 4.06 m

x = 1 (dinding tegak)

didapat tinggi breakwater sebesar:

Yc = d + h_o + $(\frac{1+x}{2})$ .H_i

= 7 + 1.7 + $(\frac{1+1}{2})$ x 4.06 = 12.76 m

= 12.5 (digunakan)

Pembebanan (Tekanan Gelombang)

Data gelombang:

H = 4.06 m

T = 9.99 dt

γ_w = 1.03 t/m^3

H_{max} = 1.8*H

= 1.8*4.06 = 7.308 m

η = 0.75 (1 + cosβ) H_{max}

= 0.75 (1 + cos(15^o)) x 7.308 = 10.775

P_1 = $\frac{1}{2}$ (1 + cosβ)(α_1 + α_2 cos$^{2\beta}$) γ_w. H_{max}

= 6.96 t/m^2

P_3 = α_3.P_1

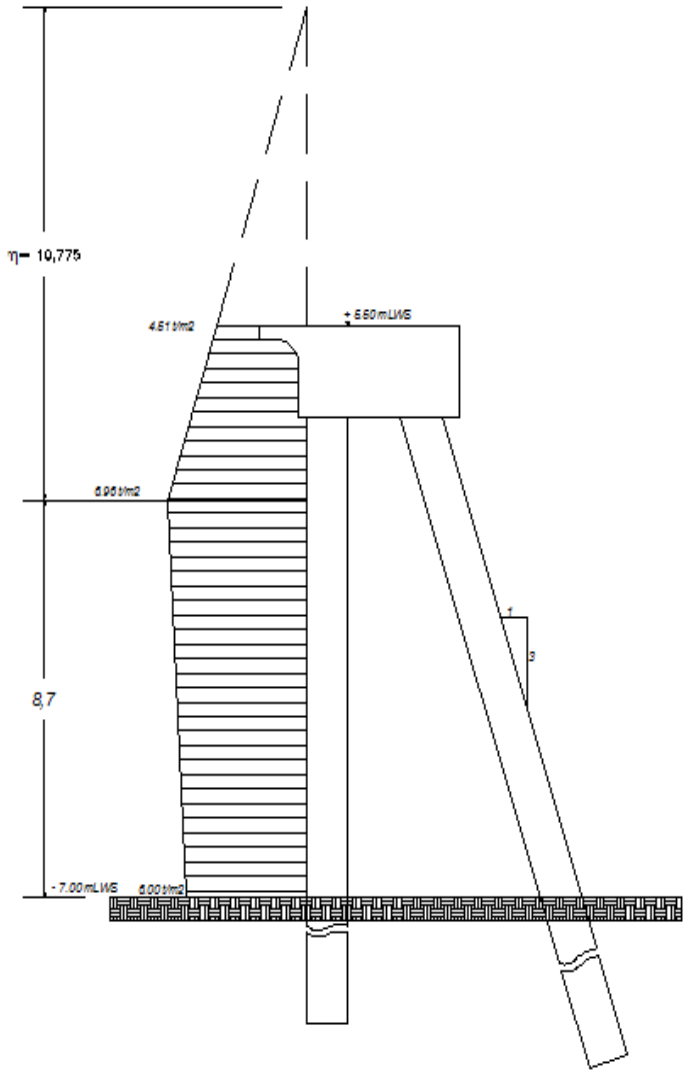
= 6.00 t/m^2

P_4 = P_1 (1 – d_c/η)

= 4.51 t/m^2

P = $\frac{1}{2}$ (P_1 + P_3) h' + $\frac{1}{2}$ (P_1 + P_4) d_c

= 74.346 ton



Pembebanan (Tekanan Tanah)

σ_{Ha} $= K_a \times \sigma_v$

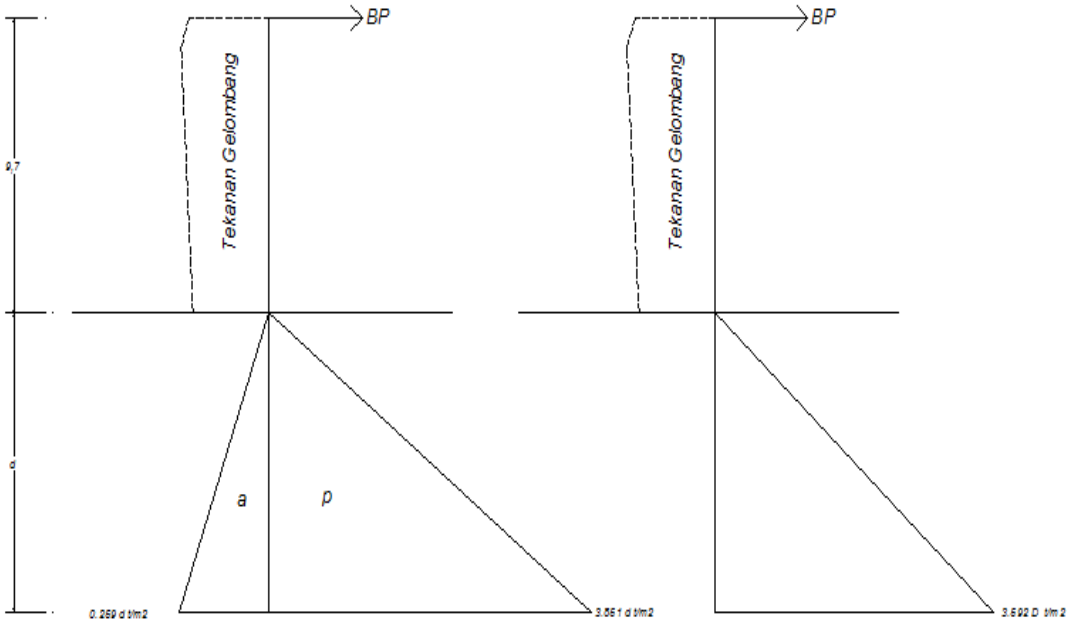
$= 0.259 \times \gamma' \times d$

$= 0.259 \times (2\text{-}1) \times d = 0.259\ d$

σ_{Hp} $= K_p \times \sigma_v$

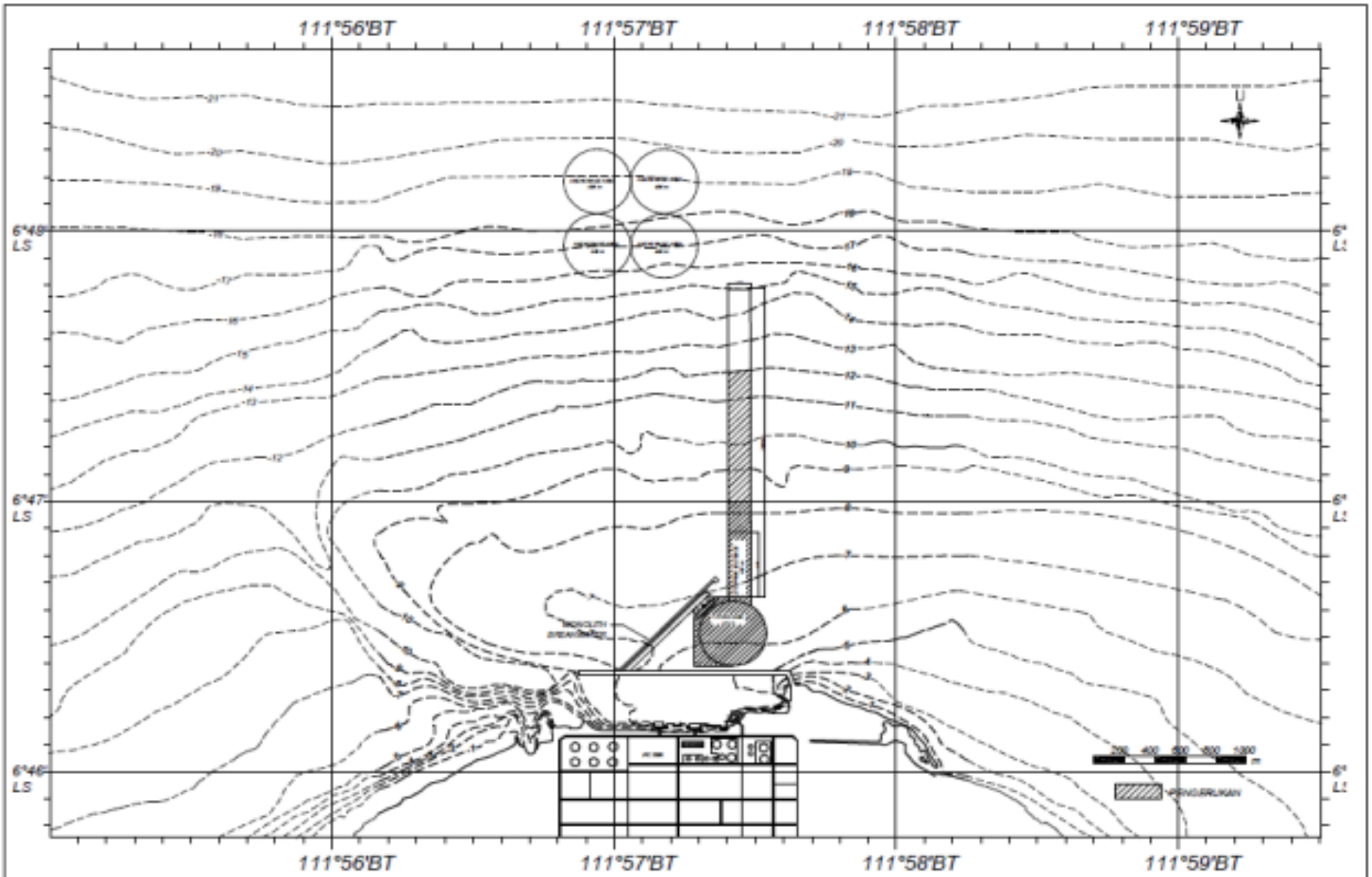
$= 3.851 \times \gamma' \times d$

$= 3.851 \times (2\text{-}1) \times d = 3.851\ d$



EVALUASI LAYOUT

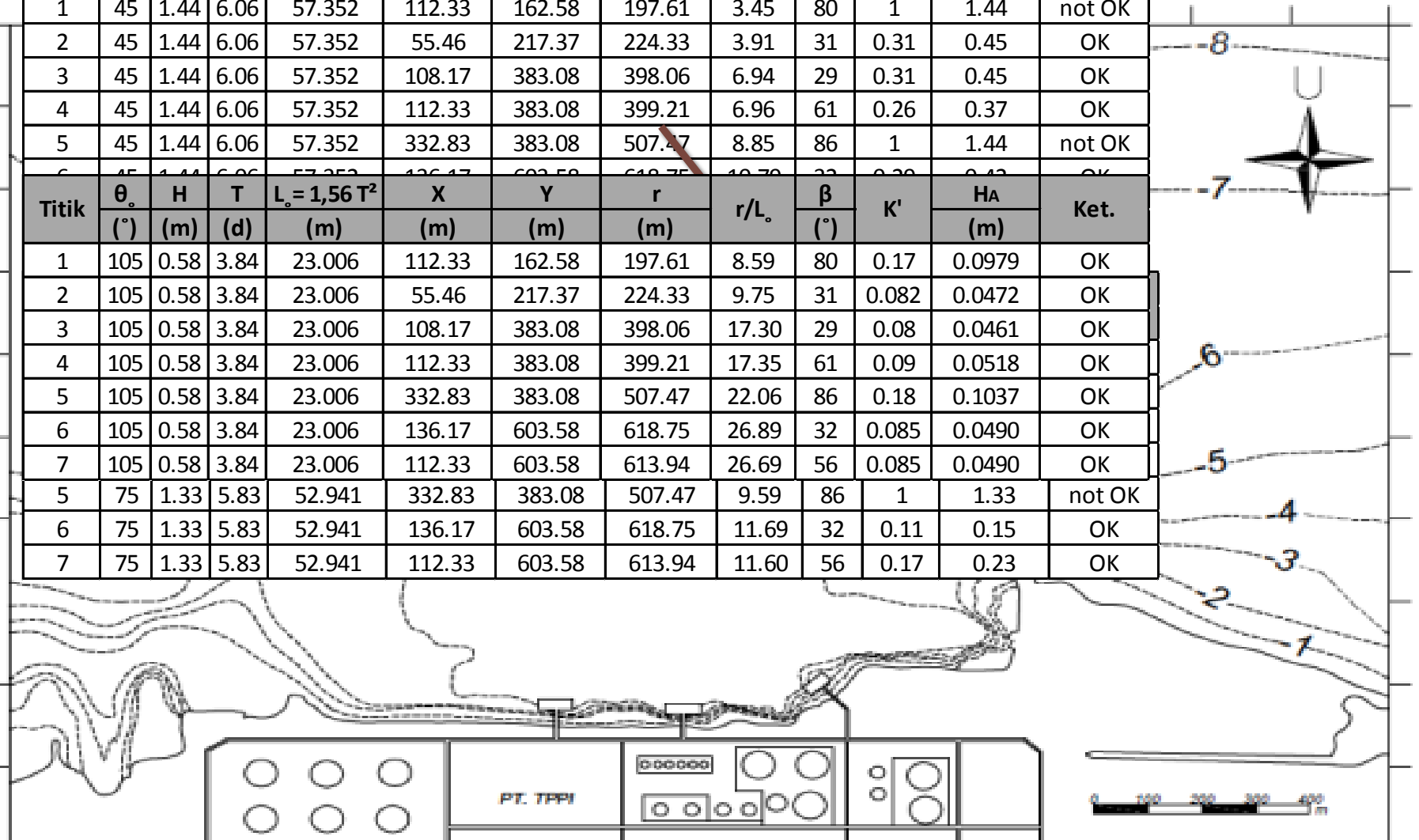
Perencanaan Layout Perairan



Difraksi Gelombang

Titik	θ_o (°)	H (m)	T (d)	$L_o = 1{,}56\ T^2$ (m)	X (m)	Y (m)	r (m)	r/L_o	β (°)	K'	H_A (m)	Ket.
1	45	1.44	6.06	57.352	112.33	162.58	197.61	3.45	80	1	1.44	not OK
2	45	1.44	6.06	57.352	55.46	217.37	224.33	3.91	31	0.31	0.45	OK
3	45	1.44	6.06	57.352	108.17	383.08	398.06	6.94	29	0.31	0.45	OK
4	45	1.44	6.06	57.352	112.33	383.08	399.21	6.96	61	0.26	0.37	OK
5	45	1.44	6.06	57.352	332.83	383.08	507.47	8.85	86	1	1.44	not OK

Titik	θ_o (°)	H (m)	T (d)	$L_o = 1{,}56\ T^2$ (m)	X (m)	Y (m)	r (m)	r/L_o	β (°)	K'	H_A (m)	Ket.
1	105	0.58	3.84	23.006	112.33	162.58	197.61	8.59	80	0.17	0.0979	OK
2	105	0.58	3.84	23.006	55.46	217.37	224.33	9.75	31	0.082	0.0472	OK
3	105	0.58	3.84	23.006	108.17	383.08	398.06	17.30	29	0.08	0.0461	OK
4	105	0.58	3.84	23.006	112.33	383.08	399.21	17.35	61	0.09	0.0518	OK
5	105	0.58	3.84	23.006	332.83	383.08	507.47	22.06	86	0.18	0.1037	OK
6	105	0.58	3.84	23.006	136.17	603.58	618.75	26.89	32	0.085	0.0490	OK
7	105	0.58	3.84	23.006	112.33	603.58	613.94	26.69	56	0.085	0.0490	OK
5	75	1.33	5.83	52.941	332.83	383.08	507.47	9.59	86	1	1.33	not OK
6	75	1.33	5.83	52.941	136.17	603.58	618.75	11.69	32	0.11	0.15	OK
7	75	1.33	5.83	52.941	112.33	603.58	613.94	11.60	56	0.17	0.23	OK

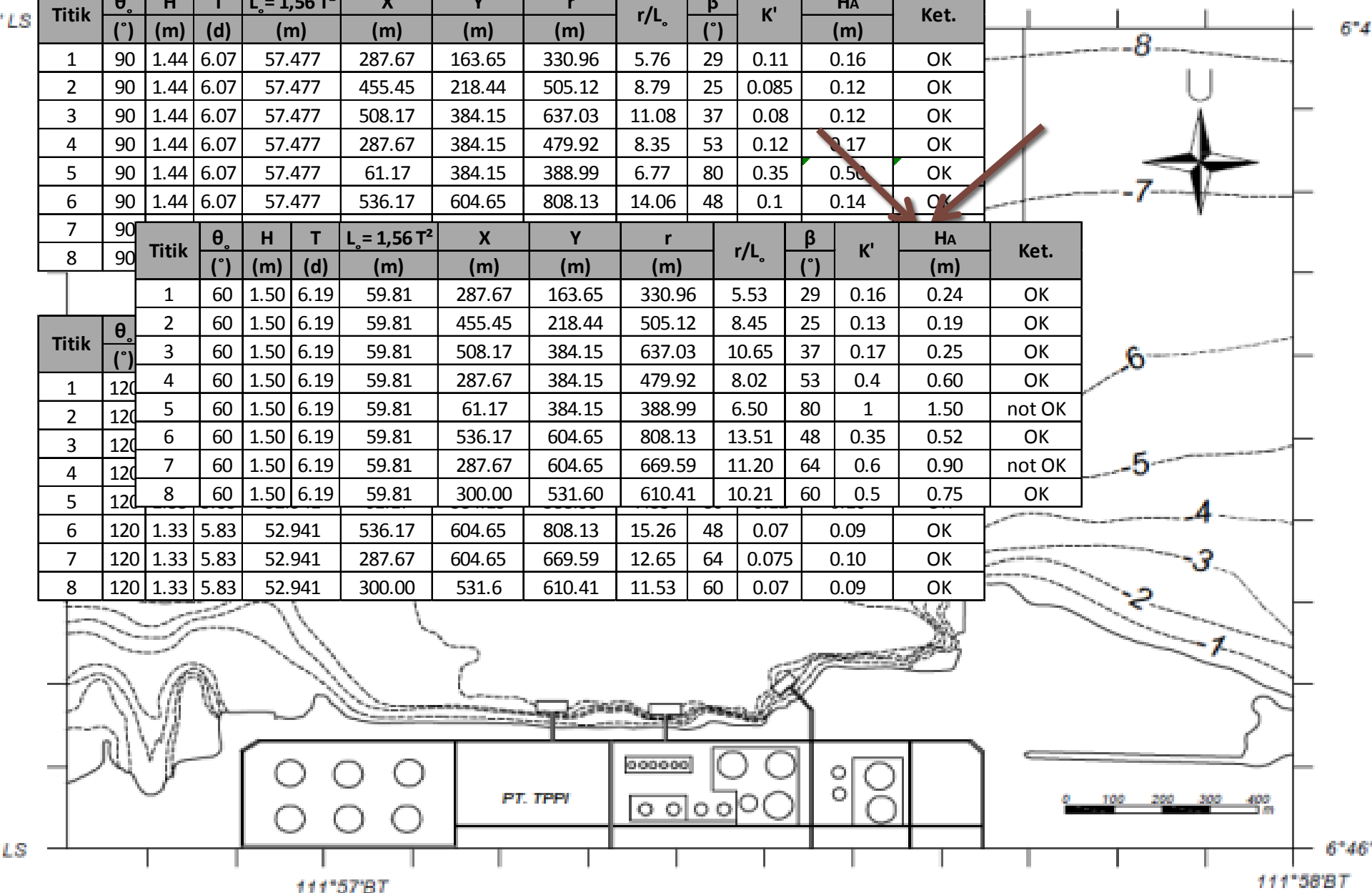


PELABUHAN PT. TPPI TANUNG AWAR AWAR

Titik	θ_o (°)	H (m)	T (d)	$L_o = 1{,}56\ T^2$ (m)	X (m)	Y (m)	r (m)	r/L_o	β (°)	K'	H_A (m)	Ket.
1	90	1.44	6.07	57.477	287.67	163.65	330.96	5.76	29	0.11	0.16	OK
2	90	1.44	6.07	57.477	455.45	218.44	505.12	8.79	25	0.085	0.12	OK
3	90	1.44	6.07	57.477	508.17	384.15	637.03	11.08	37	0.08	0.12	OK
4	90	1.44	6.07	57.477	287.67	384.15	479.92	8.35	53	0.12	0.17	OK
5	90	1.44	6.07	57.477	61.17	384.15	388.99	6.77	80	0.35	0.50	OK
6	90	1.44	6.07	57.477	536.17	604.65	808.13	14.06	48	0.1	0.14	OK
7	90											
8	90											

Titik	θ_o (°)	H (m)	T (d)	$L_o = 1{,}56\ T^2$ (m)	X (m)	Y (m)	r (m)	r/L_o	β (°)	K'	H_A (m)	Ket.
1	60	1.50	6.19	59.81	287.67	163.65	330.96	5.53	29	0.16	0.24	OK
2	60	1.50	6.19	59.81	455.45	218.44	505.12	8.45	25	0.13	0.19	OK
3	60	1.50	6.19	59.81	508.17	384.15	637.03	10.65	37	0.17	0.25	OK
4	60	1.50	6.19	59.81	287.67	384.15	479.92	8.02	53	0.4	0.60	OK
5	60	1.50	6.19	59.81	61.17	384.15	388.99	6.50	80	1	1.50	not OK
6	60	1.50	6.19	59.81	536.17	604.65	808.13	13.51	48	0.35	0.52	OK
7	60	1.50	6.19	59.81	287.67	604.65	669.59	11.20	64	0.6	0.90	not OK
8	60	1.50	6.19	59.81	300.00	531.60	610.41	10.21	60	0.5	0.75	OK

Titik	θ_o (°)	H (m)	T (d)	$L_o = 1{,}56\ T^2$ (m)	X (m)	Y (m)	r (m)	r/L_o	β (°)	K'	H_A (m)	Ket.
1	120											
2	120											
3	120											
4	120											
5	120											
6	120	1.33	5.83	52.941	536.17	604.65	808.13	15.26	48	0.07	0.09	OK
7	120	1.33	5.83	52.941	287.67	604.65	669.59	12.65	64	0.075	0.10	OK
8	120	1.33	5.83	52.941	300.00	531.6	610.41	11.53	60	0.07	0.09	OK



STRUKTUR BREAKWATER

Perencanaan Sheetpile

Dalam perhitungan ini dipakai skala sebagai berikut:

Panjang = 1 : 1m

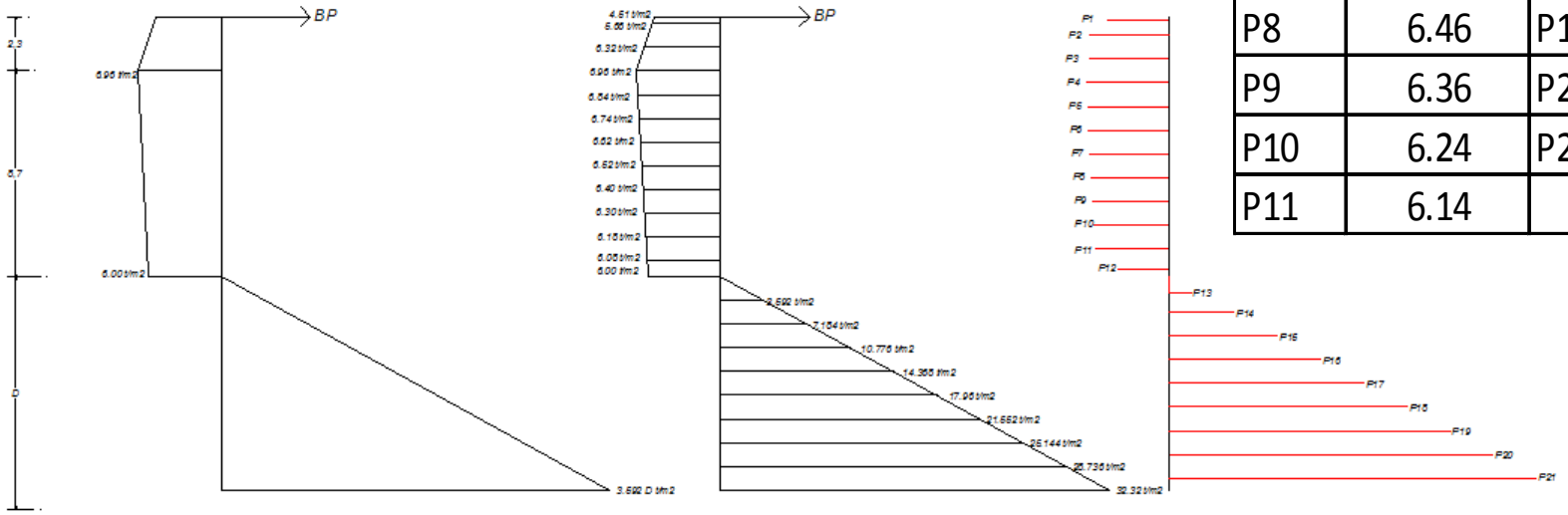
Lateral = 1 : 2 ton

Momen = 1: 20 ton.m

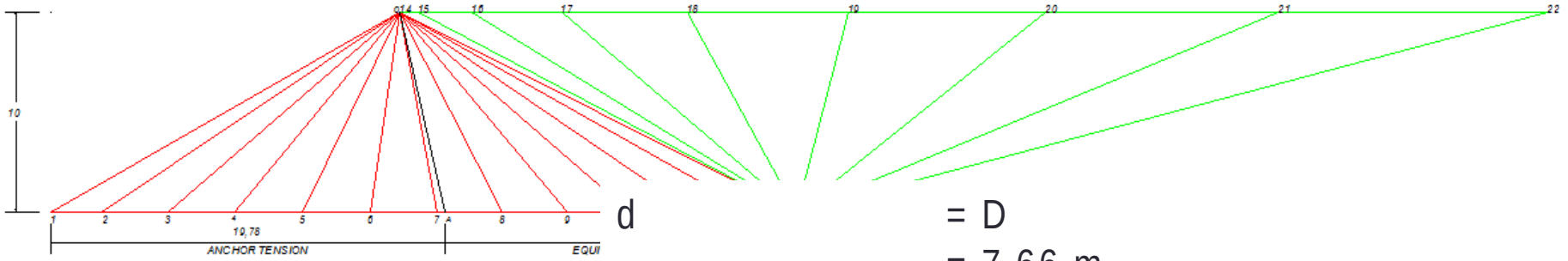
Jarak pole distance :

Pole distane = 20 / (1x2) = 10

Nama	Gaya (ton)	Nama	Gaya (ton)
P1	5.09	P12	4.22
P2	5.99	P13	1.80
P3	6.64	P14	5.38
P4	6.90	P15	8.98
P5	6.80	P16	12.58
P6	6.68	P17	16.16
P7	6.58	P18	19.76
P8	6.46	P19	23.34
P9	6.36	P20	26.94
P10	6.24	P21	30.80
P11	6.14		



Metode Grafis



d = D

= 7.66 m

Gaya Anchor = Garis A-14 x Skala Lateral

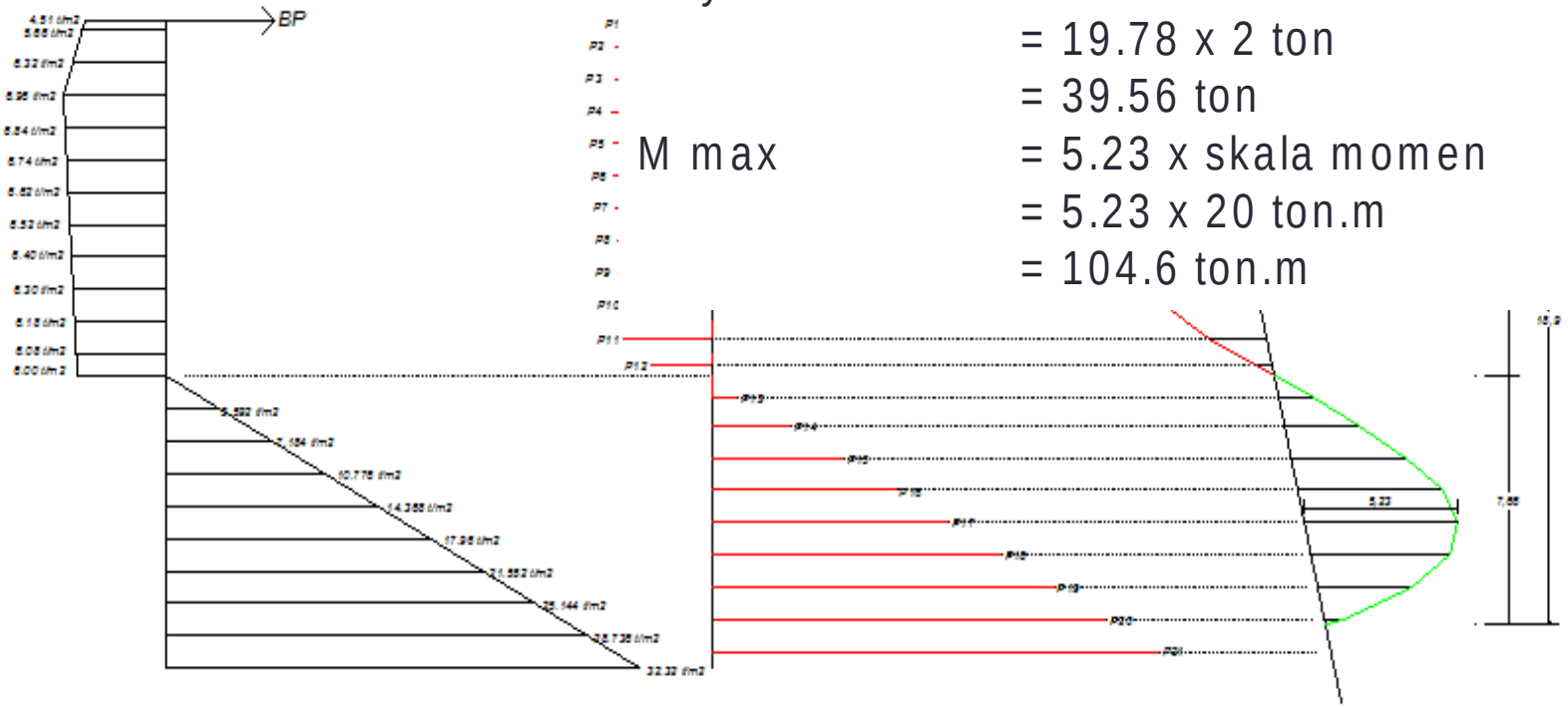
= 19.78 x 2 ton

= 39.56 ton

M max = 5.23 x skala momen

= 5.23 x 20 ton.m

= 104.6 ton.m



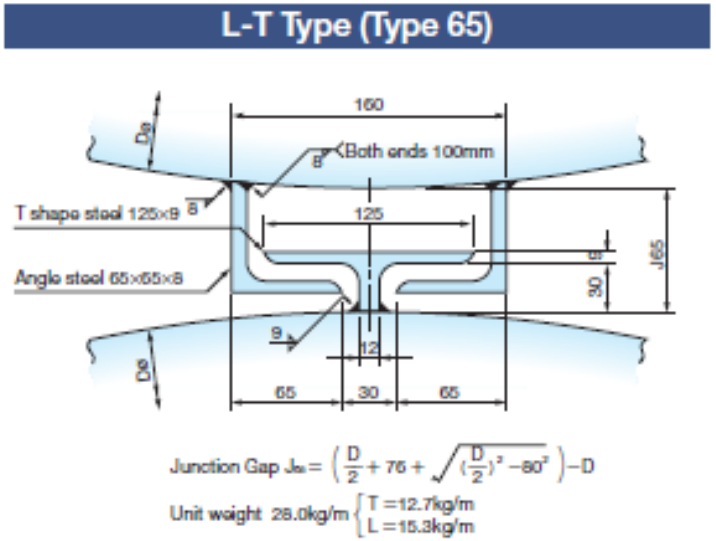
Dimensi Sheetpile

- $Z_0 = \frac{Mmax}{fy}$
- $Z_0 = \frac{104.6}{18200} = 0.00436\ m^3 = 4360\ cm^3$

		Steel Pipe Piles												
		Corrosion allowance (0mm)					Corrosion allowance (1mm)			Per 1m of pile wall width (L – T type) L65 × 65 × 8				
Diameter	Thickness	Sectional area	Unit weight	Moment of inertia	Section modulus	Radius of gyration	Sectional area	Moment of inertia	Section modulus	Junction gap J65	Sectional area	Unit weight	Moment of inertia	Section modulus
mm	mm	cm^2	kg/m	cm^4	cm^3	cm	cm^2	cm^4	cm^3	mm	cm^2/m	kg/m	cm^4	cm^3
500	6	93.1	73.1	284×10^2	114×10	17.5	77.4	235×10^2	94.5×10	—	—	—	—	—
	7	108.4	85.1	329×10^2	132×10	17.4	92.7	281×10^2	113×10	—	—	—	—	—
	8	123.7	97.1	374×10^2	150×10	17.4	108.0	325×10^2	131×10	—	—	—	—	—
	9	138.8	109	418×10^2	167×10	17.4	123.2	370×10^2	148×10		310.1	243	744×10^2	297×10
	10	153.9	121	462×10^2	185×10	17.3	138.3	413×10^2	166×10		336.9	264	821×10^2	328×10
	11	169.0	133	505×10^2	202×10	17.3	153.3	457×10^2	183×10		363.7	285	898×10^2	359×10
	12	184.0	144	548×10^2	219×10	17.3	168.3	499×10^2	200×10		390.3	306	974×10^2	389×10
	13	198.9	156	590×10^2	236×10	17.2	183.2	541×10^2	217×10		416.8	327	105×10^3	419×10
	14	213.8	168	632×10^2	253×10	17.2	198.1	583×10^2	234×10	62.9	443.2	348	112×10^3	449×10
	15	228.6	179	673×10^2	269×10	17.2	212.9	624×10^2	251×10		469.5	369	120×10^3	478×10
	16	243.3	191	713×10^2	285×10	17.1	227.6	664×10^2	267×10		495.7	389	127×10^3	507×10
	17	258.0	203	753×10^2	301×10	17.1	242.3	704×10^2	283×10		521.7	410	134×10^3	535×10
	18	272.6	214	793×10^2	317×10	17.1	256.9	744×10^2	299×10		547.7	430	141×10^3	563×10
	19	287.1	225	832×10^2	333×10	17.0	271.4	783×10^2	314×10		573.5	450	148×10^3	591×10
1000	10	311.0	244	381×10^3	762×10	35.0	279.6	342×10^3	685×10	—	—	—	—	—
	11	341.8	268	418×10^3	836×10	35.0	310.4	379×10^3	759×10		352.9	277	391×10^3	781×10
	12	372.5	292	455×10^3	909×10	34.9	341.1	415×10^3	832×10		381.6	300	425×10^3	850×10
	13	403.1	316	491×10^3	982×10	34.9	371.7	452×10^3	905×10		410.3	322	459×10^3	918×10
	14	433.7	340	527×10^3	105×10^2	34.9	402.3	488×10^3	978×10		438.9	344	493×10^3	986×10
	15	464.2	364	563×10^3	113×10^2	34.8	432.8	524×10^3	105×10^2		467.4	367	526×10^3	105×10^2
	16	494.6	388	599×10^3	120×10^2	34.8	463.2	560×10^3	112×10^2		495.8	389	560×10^3	112×10^2
	17	525.0	412	634×10^3	127×10^2	34.8	493.6	595×10^3	119×10^2		524.2	411	593×10^3	119×10^2
	18	555.3	436	670×10^3	134×10^2	34.7	523.9	630×10^3	126×10^2	69.6	552.6	434	626×10^3	125×10^2
	19	585.6	460	705×10^3	141×10^2	34.7	554.2	666×10^3	133×10^2		580.9	456	659×10^3	132×10^2
	20	615.8	483	740×10^3	148×10^2	34.7	584.4	700×10^3	140×10^2		609.1	479	691×10^3	138×10^2
	21	645.9	507	774×10^3	155×10^2	34.6	614.5	735×10^3	147×10^2		637.3	500	724×10^3	145×10^2
	22	675.9	531	809×10^3	162×10^2	34.6	644.6	769×10^3	154×10^2		665.4	522	756×10^3	151×10^2
	23	705.9	554	843×10^3	169×10^2	34.6	674.6	804×10^3	161×10^2		693.4	544	788×10^3	158×10^2
	24	735.9	578	877×10^3	175×10^2	34.5	704.5	838×10^3	168×10^2		721.4	566	820×10^3	164×10^2
	25	765.8	601	911×10^3	182×10^2	34.5	734.4	871×10^3	175×10^2		749.4	588	851×10^3	170×10^2

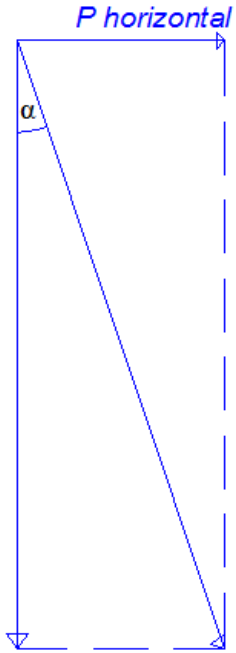
Dimensi Sheetpile

- Diameter SSPP = 1000 mm
- Tebal = 16 mm
- Junction = 69,6 mm
- Momen Inersia = 560000 cm^4
- Section Modulus = 11200 cm^3
- Fy = 182 Mpa
- Fu = 455 Mpa



Dimensi dan Kedalaman Bearing Pile (Anchor)

- Dimensi Bearing Pile yang dipakai
- Diameter = 1000 mm
- Tebal = 16 mm
- Mutu = ASTM A252 Grade 3
- Fy = 182 Mpa
- Fu = 455 Mpa



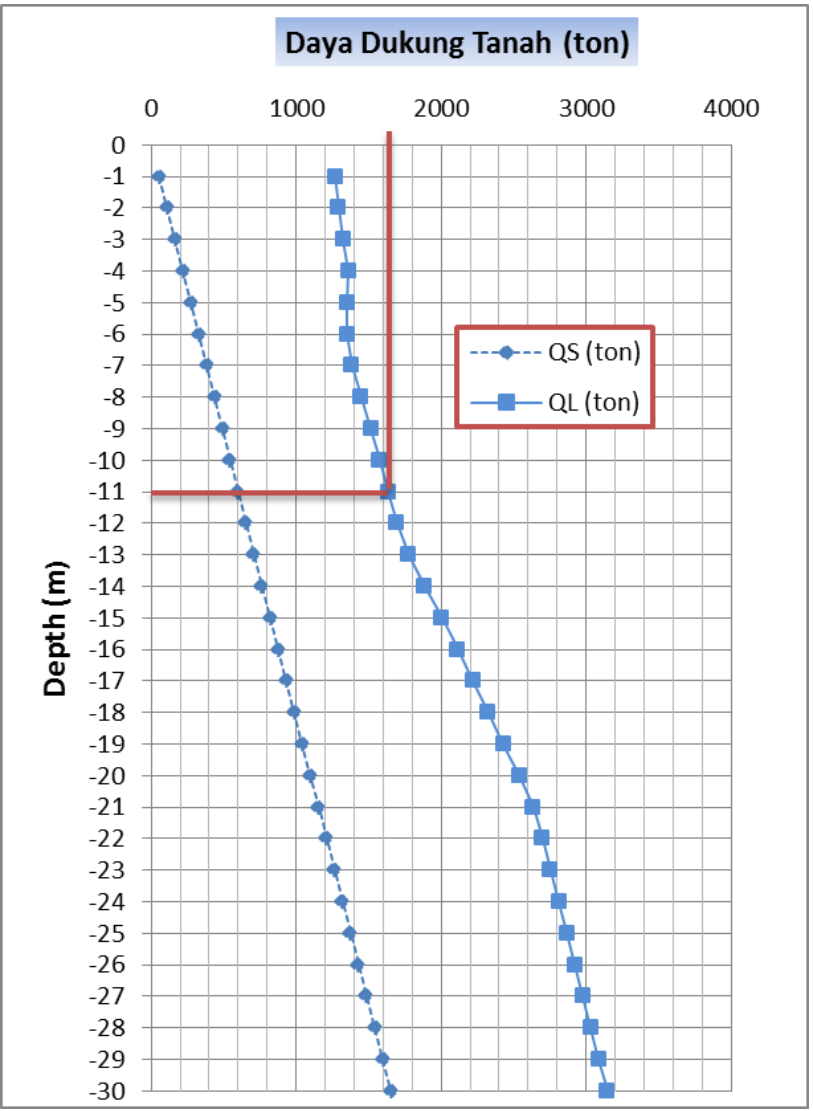
P horizontal = 39.56 ton/m . 4,25 m
= 168.13 ton per pile

SF = 3

Q horizontal = 504.39

Q bearing pile = Q horizontal / sin 18.435^{o}
= 504.39 / 0.316
= 1596.17 ton

Daya Dukung Tanah

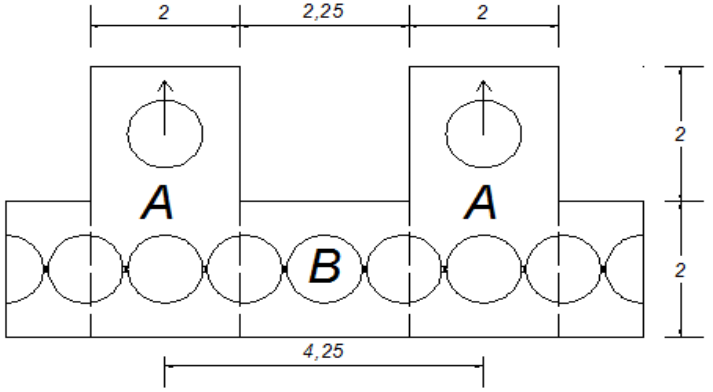


Depth(m)	Elevation(mLWS)	N	N'	Np'	K	Ap	Qp	Ns1	Ns	qs	As	Qs	QL (ton)	Qall (ton)
1.00	-1.000	80	47.5	38.7	40	0.78500	1215.2	50.0	50.0	17.7	3.14	55.5	**1270.7**	**423.6**
2.00	-2.000	75	45	37.7	40	0.78500	1182.7	50.0	50.0	17.7	6.28	111.0	**1293.7**	**431.2**
3.00	-3.000	60	37.5	36.9	40	0.78500	1159.6	50.0	50.0	17.7	9.42	166.5	**1326.1**	**442.0**
4.00	-4.000	48	31.5	36.4	40	0.78500	1142.2	48.0	49.5	17.5	12.57	219.9	**1362.1**	**454.0**
5.00	-5.000	49	32	34.4	40	0.78500	1079.4	49.0	49.4	17.5	15.71	274.4	**1353.7**	**451.2**
6.00	-6.000	50	32.5	32.6	40	0.78500	1022.5	50.0	49.5	17.5	18.85	329.9	**1352.3**	**450.8**
7.00	-7.000	50	32.5	31.8	40	0.78500	998.9	50.0	49.6	17.5	21.99	385.4	**1384.3**	**461.4**
8.00	-8.000	50	32.5	32.1	40	0.78500	1006.8	50.0	49.6	17.5	25.13	440.9	**1447.6**	**482.5**
9.00	-9.000	48	31.5	32.5	40	0.78500	1020.5	48.0	49.4	17.5	28.27	494.3	**1514.8**	**504.9**
10.00	-10.000	46	30.5	32.8	40	0.78500	1030.3	46.0	49.1	17.4	31.42	545.6	**1575.9**	**525.3**
11.00	-11.000	48	31.5	33.1	40	0.78500	1038.2	48.0	49.0	17.3	34.56	599.0	**1637.2**	**545.7**
12.00	-12.000	52	33.5	33.2	40	0.78500	1042.1	50.0	49.1	17.4	37.70	654.5	**1696.6**	**565.5**
13.00	-13.000	56	35.5	33.9	40	0.78500	1065.6	50.0	49.2	17.4	40.84	710.0	**1775.6**	**591.9**
14.00	-14.000	55	35	35.8	40	0.78500	1122.6	50.0	49.2	17.4	43.98	765.5	**1888.1**	**629.4**
15.00	-15.000	54	34.5	37.8	40	0.78500	1185.4	50.0	49.3	17.4	47.12	821.0	**2006.4**	**668.8**
16.00	-16.000	52	33.5	39.5	40	0.78500	1240.3	50.0	49.3	17.4	50.27	876.5	**2116.8**	**705.6**
17.00	-17.000	60	37.5	41.0	40	0.78500	1287.4	50.0	49.4	17.5	53.41	932.0	**2219.4**	**739.8**
18.00	-18.000	75	45	42.6	40	0.78500	1336.5	50.0	49.4	17.5	56.55	987.5	**2324.0**	**774.7**
19.00	-19.000	80	47.5	44.2	40	0.78500	1387.5	50.0	49.4	17.5	59.69	1043.0	**2430.5**	**810.2**
20.00	-20.000	80	47.5	45.9	40	0.78500	1442.4	50.0	49.5	17.5	62.83	1098.5	**2540.9**	**847.0**
21.00	-21.000	80	47.5	47.2	40	0.78500	1481.7	50.0	49.5	17.5	65.97	1154.0	**2635.7**	**878.6**
22.00	-22.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.5	17.5	69.12	1209.5	**2701.0**	**900.3**
23.00	-23.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.5	17.5	72.26	1265.0	**2756.5**	**918.8**
24.00	-24.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.5	17.5	75.40	1320.5	**2812.0**	**937.3**
25.00	-25.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.6	17.5	78.54	1376.0	**2867.5**	**955.8**
26.00	-26.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.6	17.5	81.68	1431.5	**2923.0**	**974.3**
27.00	-27.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.6	17.5	84.82	1487.0	**2978.5**	**992.8**
28.00	-28.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.6	17.5	87.96	1542.5	**3034.0**	**1011.3**
29.00	-29.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.6	17.5	91.11	1598.0	**3089.5**	**1029.8**
30.00	-30.000	80	47.5	47.5	40	0.78500	1491.5	50.0	49.6	17.5	94.25	1653.5	**3145.0**	**1048.3**

Bulkhead

Data data perencanaan

Lebar (b) = 200 cm
Tinggi (h) = 200 cm
Panjang = 400 cm
Selimut beton = 8 cm

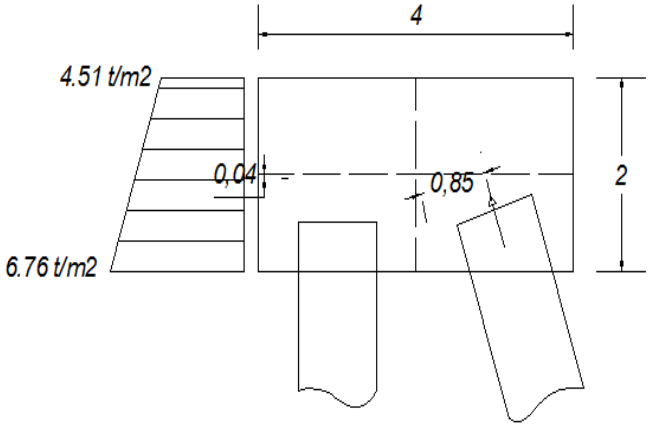


Gaya yang Bekerja

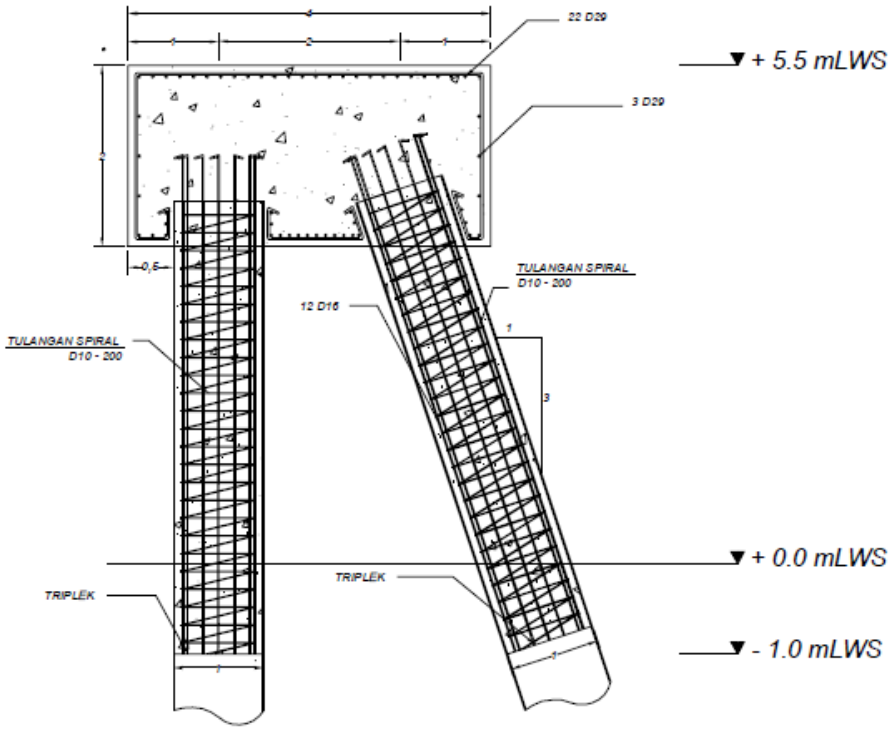
Bearing pile = 168.13 ton/ $\sin 18.435^0$
= 531.672

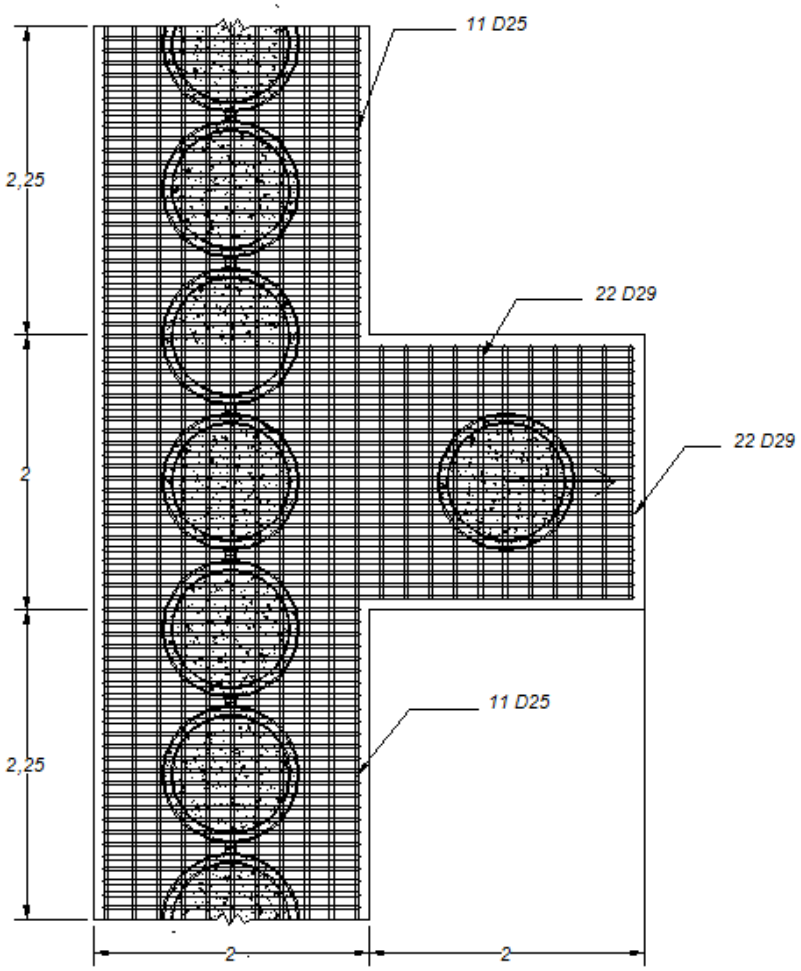
Tekanan Gelombang = $\frac{(4.51+6.76)}{2}$ x 2
= 12.24

Momen = 531.672 x 0.85 + 12.24 x 0.04
= 452.411 ton.m



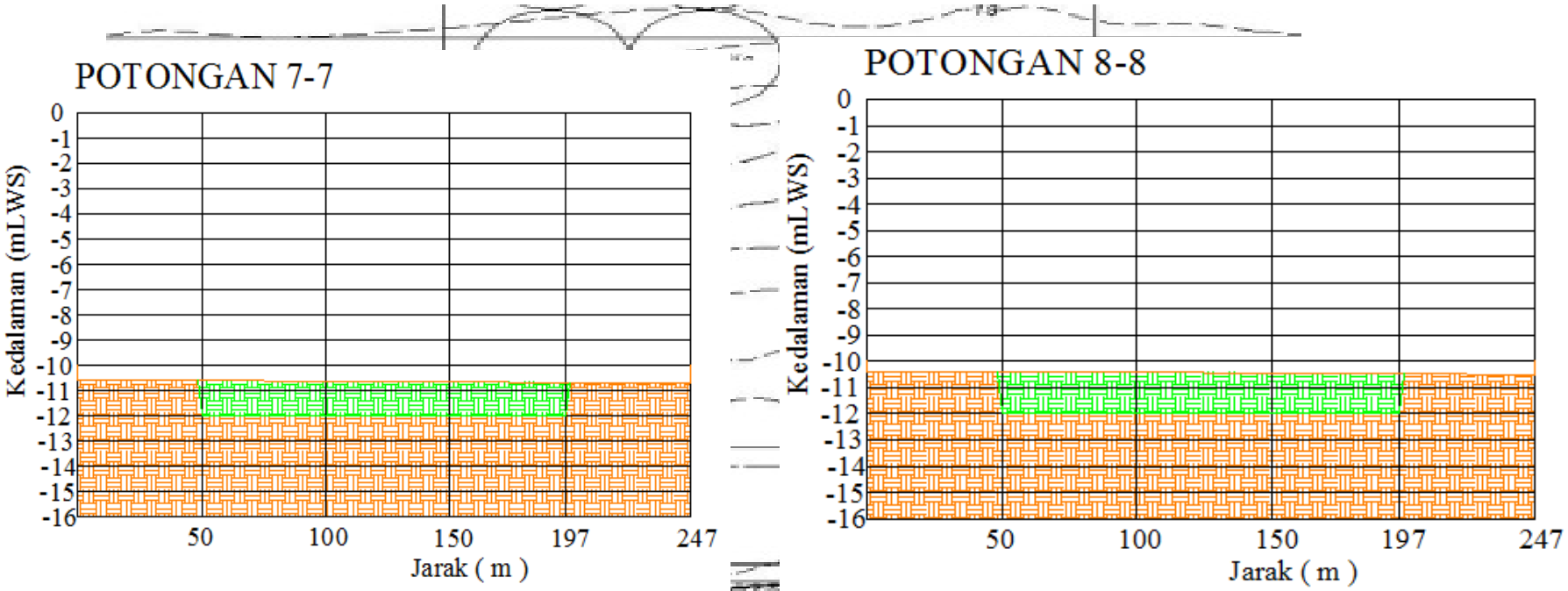
- Tuangan Tarik
  22 –D29 dengan luas
- Tulangan Tekan
  9 –D29 dengan luas
- Tulangan Samping
  3 –D29 dengan luas

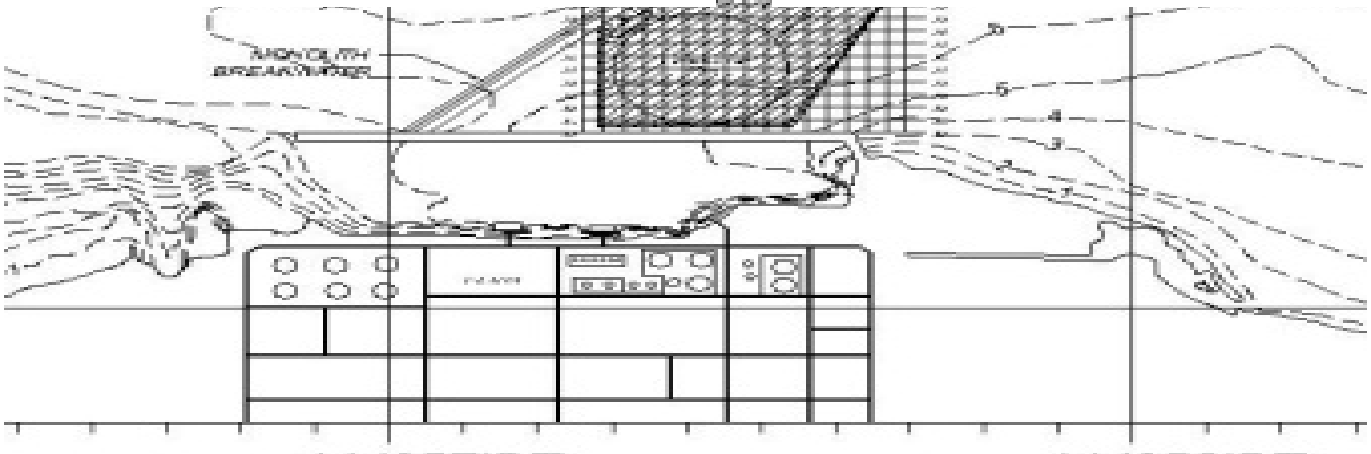




PENGERUKAN

Potongan Melintang





Volume Pengerukan

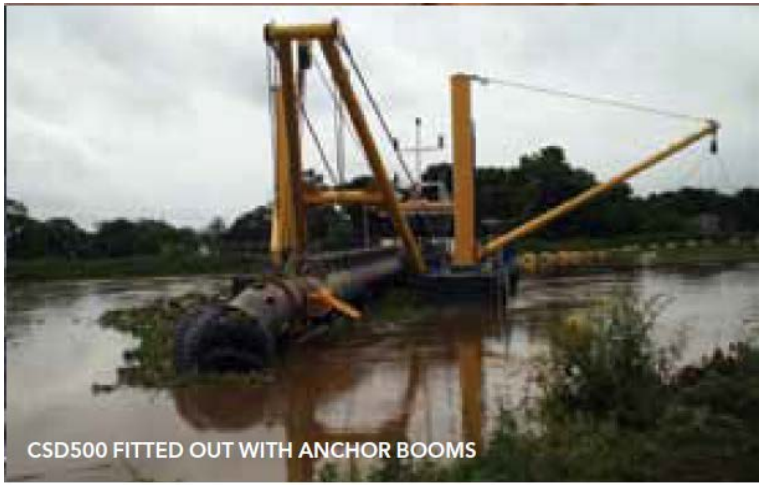
No.	Potongan	A (m^2)	A rata-rata(m^2)	jarak (m)	volume (m^3)
1	1-1	0.00			
2	2-2	30.80	15.40	50.00	770.00
3	3-3	67.22	49.01	50.00	2450.50
4	4-4	103.81	85.52	50.00	4275.75
5	5-5	140.60	122.21	50.00	6110.25
6	6-6	172.51	156.56	50.00	7827.75
7	7-7	203.01	187.76	50.00	9388.00
8	8-8	233.65	218.33	50.00	10916.50
9	9-9	264.13	248.89	50.00	12444.50
10	10-10	295.41	279.77	50.00	13988.50
11	11-11	329.74	312.58	50.00	15628.75
12	12-12	365.17	347.46	50.00	17372.75
13	13-13	400.70	382.94	50.00	19146.75
14	14-14	436.51	418.61	50.00	20930.25
15	15-15	464.89	450.70	50.00	22535.00
16	16-16	491.00	477.95	50.00	23897.25
17	17-17	517.26	504.13	50.00	25206.50
18	18-18	543.59	530.43	50.00	26521.25
19	19-19	569.87	556.73	50.00	27836.50
20	20-20	596.42	583.15	50.00	29157.25
21	21-21	620.27	608.35	50.00	30417.25
22	22-22	643.63	631.95	50.00	31597.50
23	23-23	667.07	655.35	50.00	32767.50
24	24-24	690.54	678.81	50.00	33940.25
25	25-25	715.12	702.83	50.00	35141.50
26	26-26	737.60	726.36	50.00	36318.00
27	27-27	760.66	749.13	50.00	37456.50
28	28-28	777.80	769.23	50.00	38461.50

No.	Potongan	A (m^2)	A rata-rata(m^2)	jarak (m)	volume (m^3)
29	29-29	792.18	784.99	50.00	39249.50
30	30-30	807.22	799.70	50.00	39985.00
31	31-31	897.99	852.61	42.00	35809.41
32	32-32	2992.27	1945.13	50.00	97256.50
33	33-33	3179.20	3085.74	50.00	154286.75
34	34-34	3396.41	3287.81	50.00	164390.25
35	35-35	3485.07	3440.74	50.00	172037.00
36	36-36	3423.32	3454.20	50.00	172709.75
37	37-37	3357.68	3390.50	50.00	169525.00
38	38-38	3290.90	3324.29	50.00	166214.50
39	39-39	3269.90	3280.40	50.00	164020.00
40	40-40	3254.92	3262.41	50.00	163120.50
41	41-41	3235.35	3245.14	50.00	162256.75
42	42-42	0.00	1617.68	50.00	80883.75
VOLUME TOTAL					**2354248.66**

Volume = *bulking factor* x volume pengerukan
= 1,4 x 2.354.248
= 3.295.947,2 m^3

Pemilihan Kapal Keruk

Type of Soil			Type of Dredger				
Klasifikasi	State	N Value	CSD	TSHD	Grab	Bucket	Dipper
Clay	Soft mud	'- 4					
	Soft	4 – 10					
	Medium	10 – 20					
	Hard	20 – 30					
	Harder	30 – 40					
	Hardest	40 – 50					
Sand	Soft	'- 10					
	Medium	10 – 20					
	Hard	20 – 30					
	Harder	30 – 40					
	Hardest	40 – 50					
Clay w/ Gravel	Soft	'- 30					
	Hard	30 –					
Rock	Softer	40 – 50					
	Soft	50 – 60					
	Medium						
	Hard						
	Hardest						
Gravel	Loose						
	Packed						



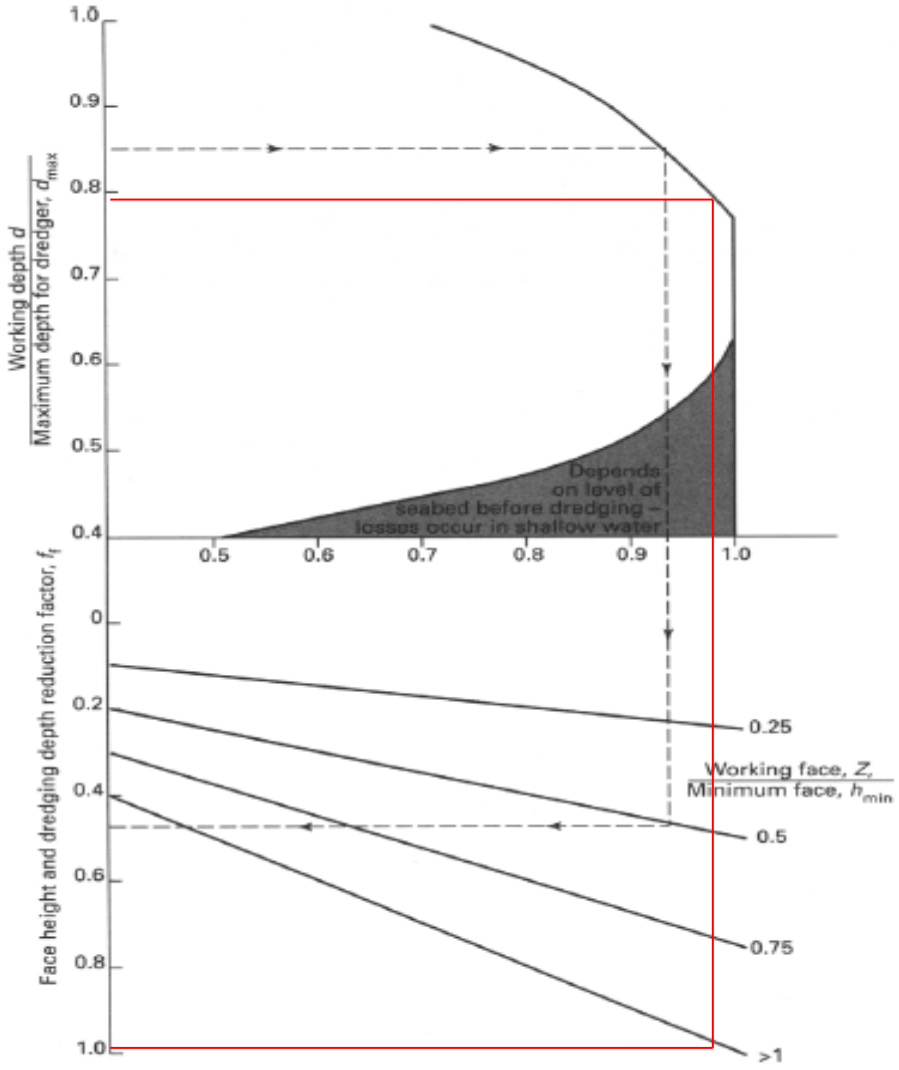
Name		CSD500
Type		Cutter Sucton Dredger
Dimension	Length o.a.	19.00 m
	Length over Pontoons	11.50 m
	Beam o.a	4.20 m
	Draught	1.00 m
Dredging Feature	min/max dredging depth	2.5/14 m
	Dredging Width	39.60 m
	Max. Mixture Capacity	4000 m^3/jam

Produktivitas Alat Keruk

Produktivitas = Kapasitas x kandungan tanah
= 4000 x 40%
= 1600 m^3/jam

P_{nom} = f_f x Produktivitas
= 0.95 x 1600
= 1520 m^3/jam

P_{max} = $f_p . f_a . f_h . P_{nom}$
= 0.81 x 0.97 x 0.85 x 1520
= 1015,12 m^3/jam



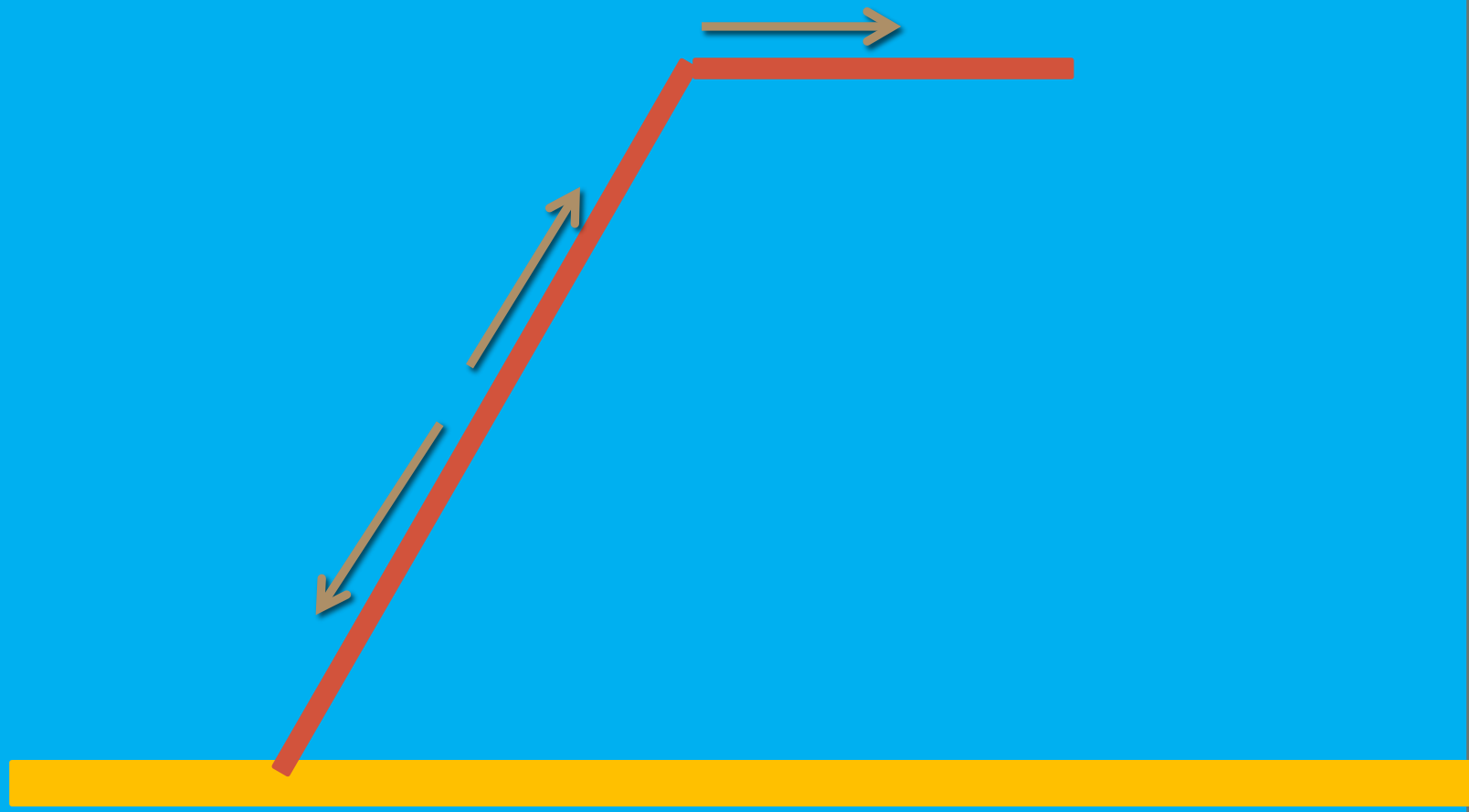
Waktu Pengerukan

- T $= \frac{V}{Pmax\ x\ n}$

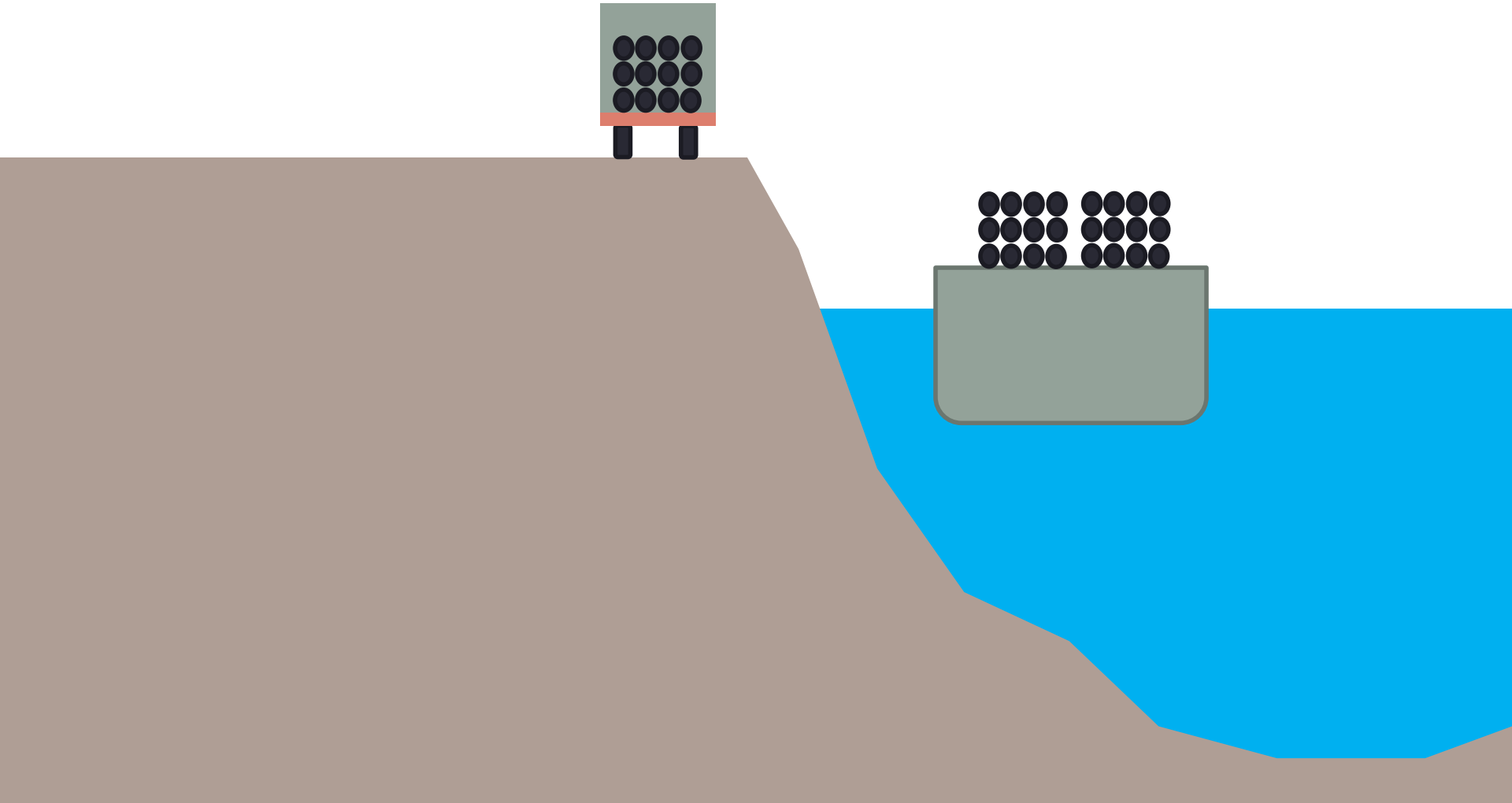
$= \frac{3295947,2}{1015,12\ x\ 1} = 3246,85$ jam

$= 4,51$ bulan

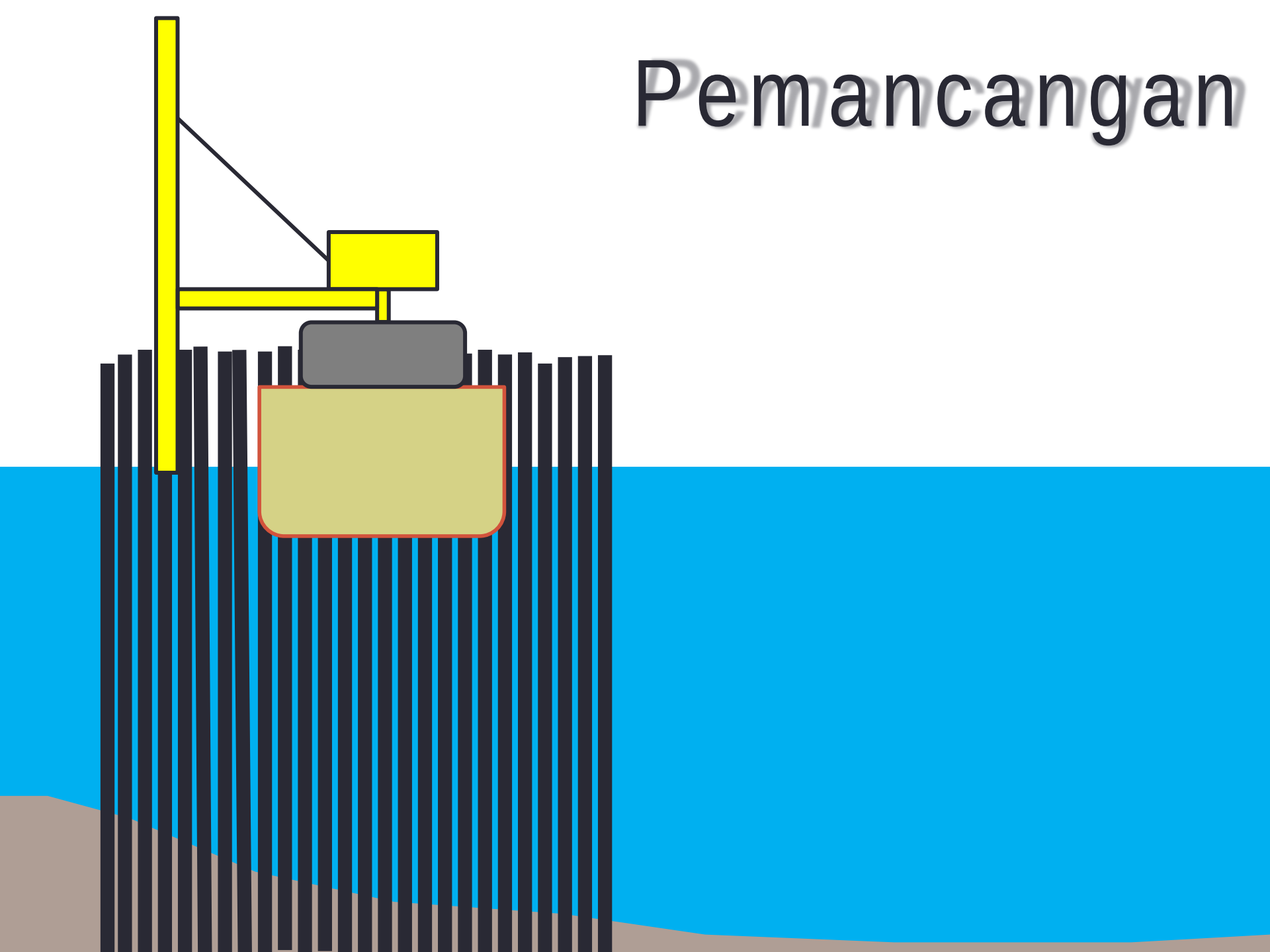
METODE PELAKSANAAN

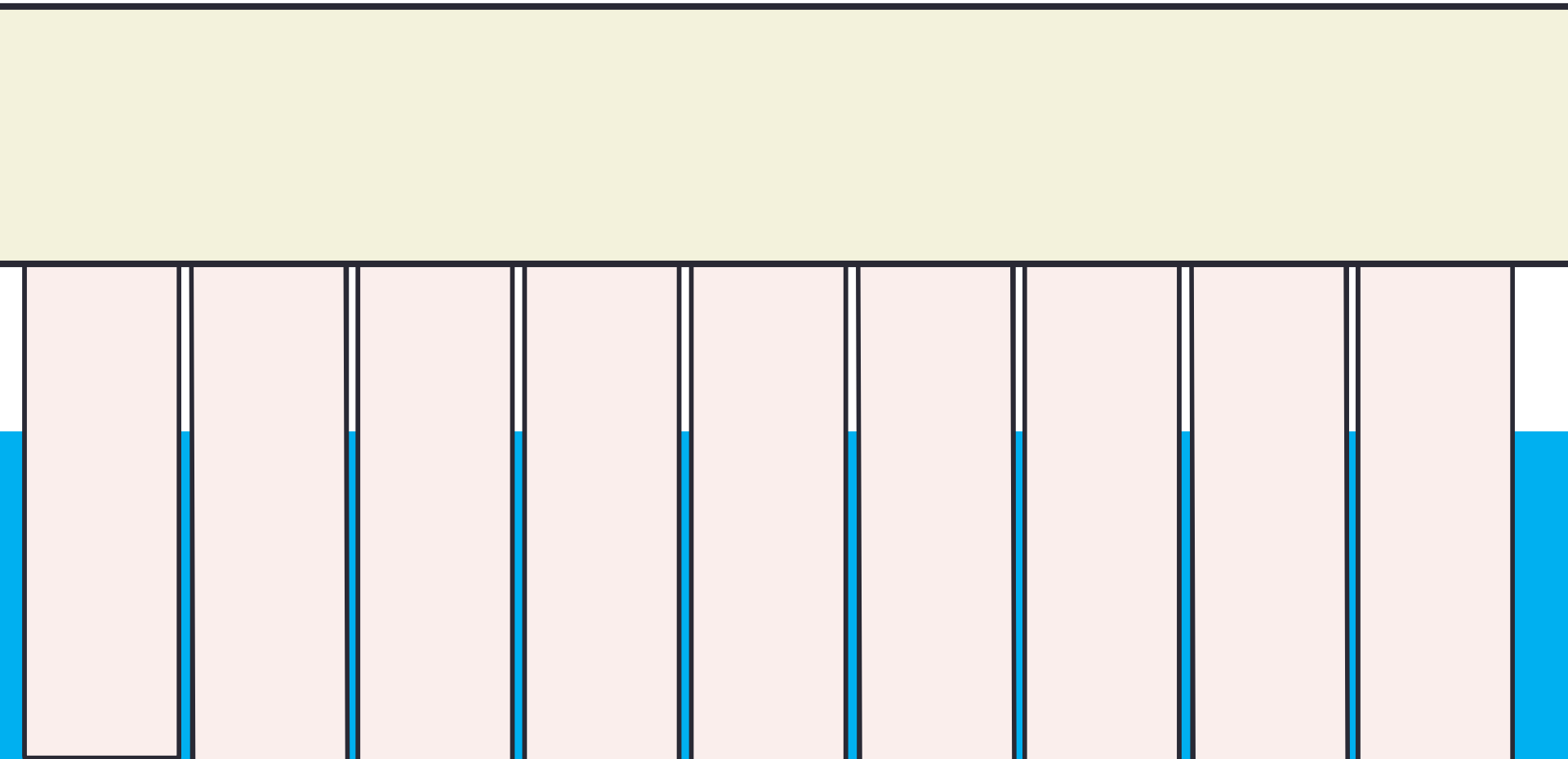


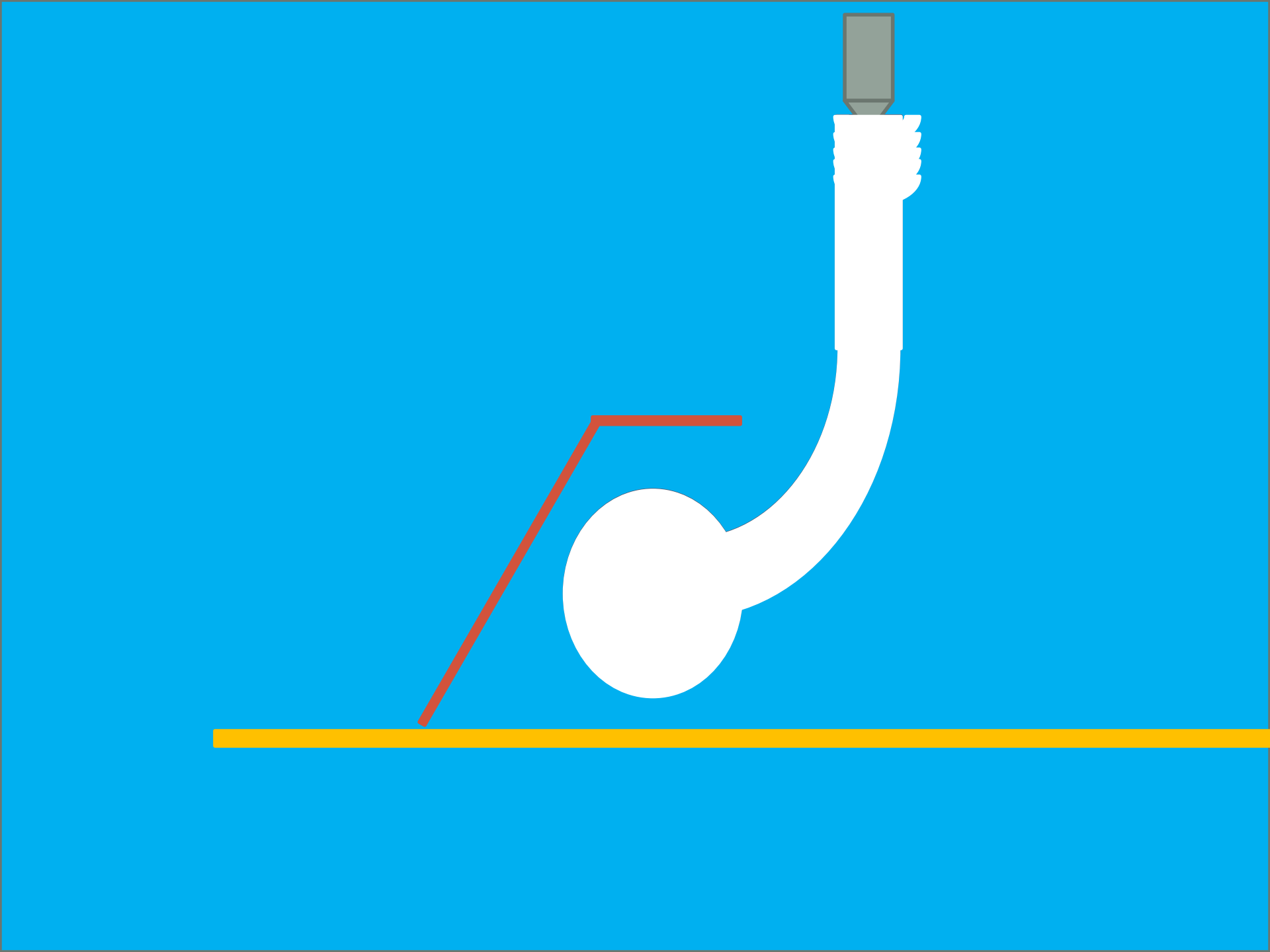
Pengiriman Material



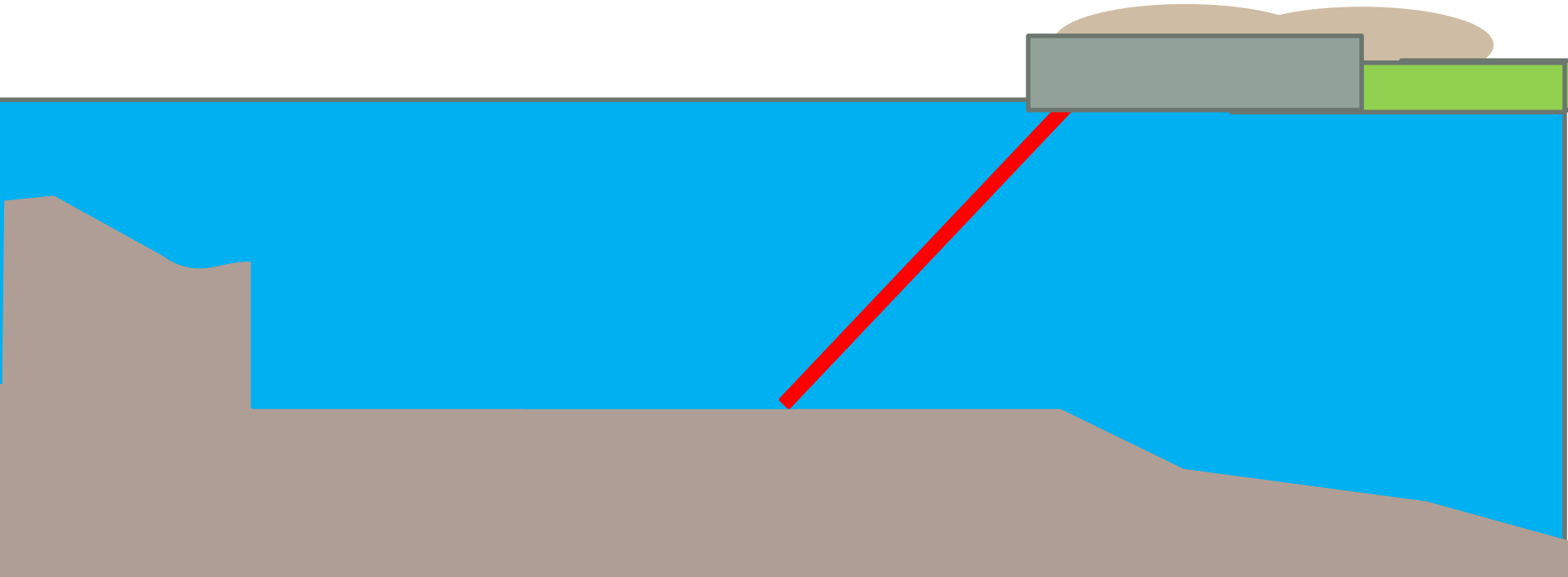
Pemancangan





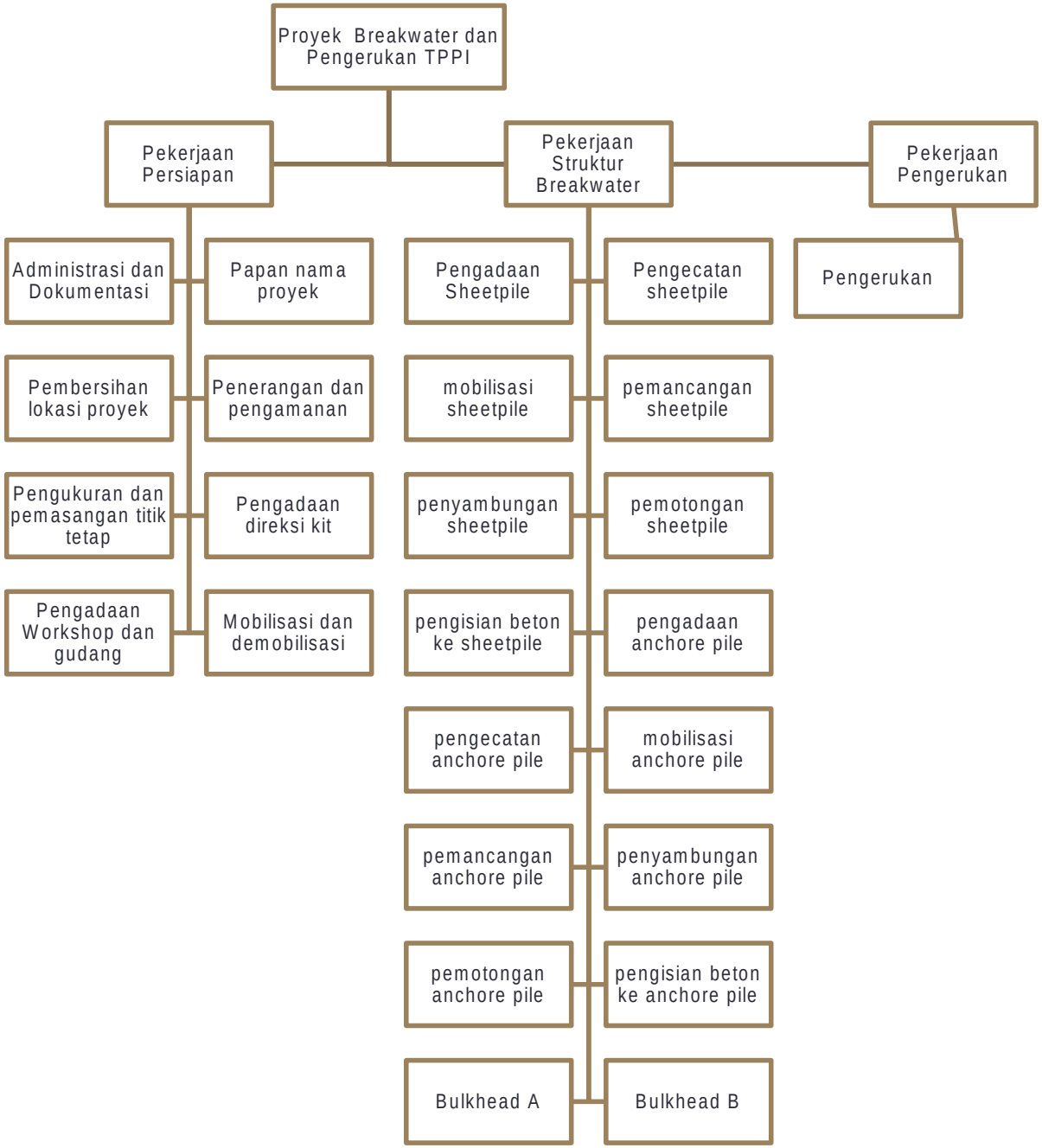


Pengerukan



WORK BREAKDOWN STRUCTURE DAN RAB

WBS


Proyek Breakwater dan Pengerukan TPPI
Pekerjaan Persiapan
Pekerjaan Struktur Breakwater
Pekerjaan Pengerukan
Administrasi dan Dokumentasi
Papan nama proyek
Pembersihan lokasi proyek
Penerangan dan pengamanan
Pengukuran dan pemasangan titik tetap
Pengadaan direksi kit
Pengadaan Workshop dan gudang
Mobilisasi dan demobilisasi
Pengadaan Sheetpile
Pengecatan sheetpile
mobilisasi sheetpile
pemancangan sheetpile
penyambungan sheetpile
pemotongan sheetpile
pengisian beton ke sheetpile
pengadaan anchore pile
pengecatan anchore pile
mobilisasi anchore pile
pemancangan anchore pile
penyambungan anchore pile
pemotongan anchore pile
pengisian beton ke anchore pile
Bulkhead A
Bulkhead B
Pengerukan

Rencana Anggaran Biaya

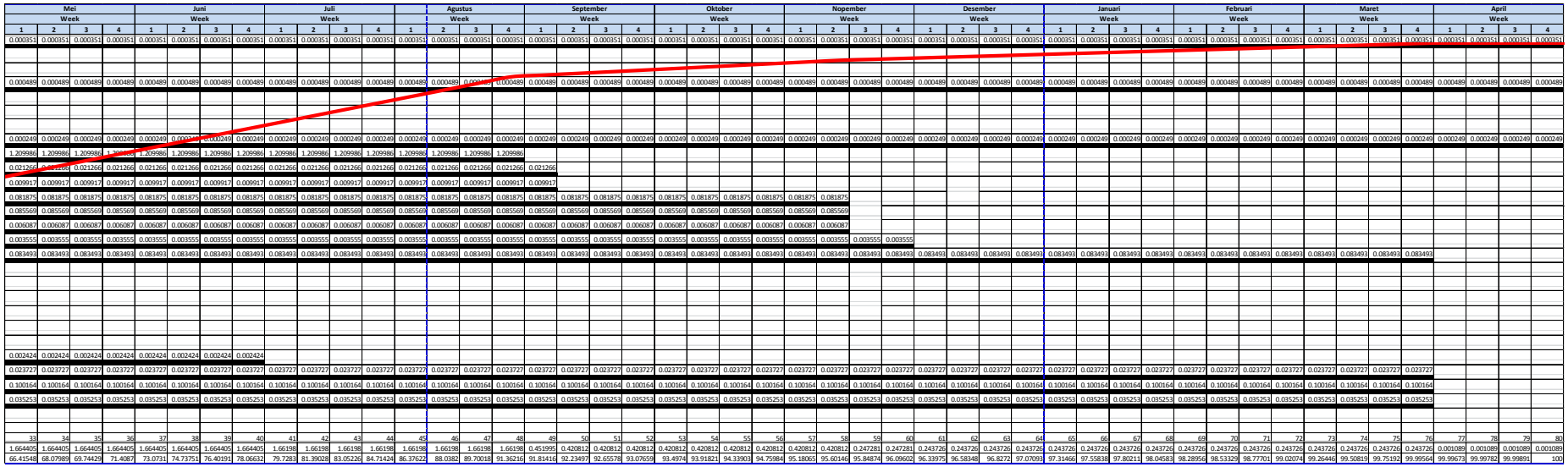
No.	Pekerjaan	Harga Pekerjaan
1	Pekerjaan Persiapan	Rp 484,877,642.17
2	Pekerjaan Struktur Breakwater	Rp 314,726,639,356.89
3	Pekerjaan Pengerukan	Rp 65,475,000,000.00
Total		Rp 380,686,516,999.06
Profit + O.H 10 %		Rp 38,068,651,699.91
Jumlah		Rp 418,755,168,698.96
PPn 10%		Rp 41,875,516,869.90
Jumlah Akhir		Rp 460,630,685,568.86
Jumlah Akhir (Dibulatkan)		**Rp 460,630,686,000.00**

KURVA S

Kurva S

No	URAIAN PEKERJAAN		Cost	Total Bobot	September				Oktober				Nopember				Desember				Januari				Februari				Maret				April			
					Week				Week				Week				Week				Week				Week				Week				Week			
					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
I	PERSIAPAN	Administrasi dan dokumentasi	Rp	107,561,600	0.0281	0.000351	0.000351	0.000351	0.0003514	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351
		Papan Nama Proyek	Rp	869,798	0.0002		0.0002																													
		Pembersihan Lokasi Proyek	Rp	101,825,891	0.0266			0.006654	0.0066537	0.006654	0.006654																										
		Penerangan dan Pengamanan	Rp	143,970,354	0.0376				0.0004887	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489
		Pengukuran dan pemasangan titik tetap	Rp	5,000,000	0.0013							0.0013																								
		pengadaan direksi kit	Rp	25,200,000	0.0066							0.0033	0.0033																							
		pengadaan workshop dan gudang	Rp	25,200,000	0.0066							0.0033	0.0033																							
		mobilisasi dan demobilisasi	Rp	75,250,000	0.0197		0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249
II	Struktur Breakwater	Pengadaan Sheet Pile (Tiang Pancang)	Rp	185,172,480,000.00	48.3994								1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986
		PengecatanTiang Pancang	Rp	3,254,477,388.52	0.8506									0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266
		Pembuatan Sepatu Tiang	Rp	1,517,666,067.00	0.3967									0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917
		Mobilisasi Sheet pile (Tiang Pancang)	Rp	15,035,844,866.59	3.9300										0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875
		Pemancangan Sheet pile	Rp	15,714,318,173.56	4.1073										0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569
		Penyambungan Sheet pile	Rp	1,117,777,327.42	0.2922										0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087
		Pemotongan Sheet pile	Rp	435,217,902.39	0.1138																												0.003555	0.003555	0.003555	0.003555
		Pengisian Beton ke Sheet pile	Rp	14,055,312,956.48	3.6737																															
		Pengadaan Anchor pile	Rp	44,224,200,000.00	11.5591								0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373	0.608373					
		Pengecatan Anchore pile (Tiang Pancang)	Rp	832,354,003.15	0.2176									0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145	0.01145				
		Pembuatan Sepatu Tiang	Rp	388,153,081.28	0.1015									0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636	0.005636				
		Mobilisasi Anchor pile	Rp	3,845,516,244.66	1.0051										0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863	0.047863
		Pemancangan Anchor pile (Tiang Pancang miring)	Rp	3,851,580,245.87	1.0067										0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938	0.047938
		Penyambungan Anchor pile	Rp	285,878,905.29	0.0747										0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558	0.003558
		Pemotongan Anchor pile	Rp	111,309,841.81	0.0291																												0.002424	0.002424	0.002424	0.002424
		Pengisian Beton ke Anchor pile	Rp	3,994,154,175.32	1.0440																															
		Bullhead A	Rp	16,861,681,405.57	4.4072																															
		Bullhead B	Rp	5,934,535,920.25	1.5511																															
III	Pengerukan	Pengerukan	Rp	65,475,000,000	17.1135								0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676	0.855676				
	Total		Rp	382,592,336,147	100.000																															
	WEEK					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	BOBOT RENCANA					0.000351	0.000828	0.007254	0.0077428	0.007743	0.007743	0.008983	0.863352	2.675124	2.723393	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	2.996284	1.526598	1.521127	1.521127	1.521127	1.421768
	KUMULATIF BOBOT RENCANA					0.000351	0.001179	0.008433	0.016176	0.023919	0.031662	0.040644	0.903996	3.579119	6.302513	9.298796	12.29508	15.29136	18.28765	21.28393	24.28021	27.2765	30.27278	33.26906	36.26535	39.26163	42.25791	45.2542	48.25048	51.24677	54.24305	57.23933	58.76593	60.28706	61.80819	63.32931	64.75108

Kurva S



Mei				Juni				Juli					Agustus			September				Oktober				Nopember				Desember				Januari				Februari				Maret				April			
Week				Week				Week					Week			Week				Week				Week				Week				Week				Week				Week				Week			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351	0.000351
0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489	0.000489
0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249	0.000249
1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986	1.209986																																
0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266	0.021266																															
0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917	0.009917																															
0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875	0.081875																				
0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569	0.085569																				
0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087	0.006087																				
0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555	0.003555																		
0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493	0.083493								
0.002424	0.002424	0.002424	0.002424	0.002424	0.002424	0.002424	0.002424																																						
0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727	0.023727				
0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164	0.100164				
0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253	0.035253				
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1.664405	1.664405	1.664405	1.664405	1.664405	1.664405	1.664405	1.664405	1.66198	1.66198	1.66198	1.66198	1.66198	1.66198	1.66198	1.66198	0.451995	0.420812	0.420812	0.420812	0.420812	0.420812	0.420812	0.420812	0.420812	0.420812	0.247281	0.247281	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.243726	0.001089	0.001089	0.001089	0.001089
66.41548	68.07989	69.74429	71.4087	73.0731	74.73751	76.40191	78.06632	79.7283	81.39028	83.05226	84.71424	86.37622	88.0382	89.70018	91.36216	91.81416	92.23497	92.65578	93.07659	93.4974	93.91821	94.33903	94.75984	95.18065	95.60146	95.84874	96.09602	96.33975	96.58348	96.8272	97.07093	97.31466	97.55838	97.80211	98.04583	98.28956	98.53329	98.77701	99.02074	99.26446	99.50819	99.75192	99.99564	99.99673	99.99782	99.99891	100

DURASI PROYEK ADALAH 20 BULAN

DIMULAI PADA SEPTEMBER 2016-APRIL 2018

TERIMA KASIH